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EDITORIAL.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Important. Export of Tobacco Licences, 1933.—The attention of all tobacco growers is drawn to Government Notice No. 162 of 1932 in connection with the licences required for the export of tobacco under the Tobacco Pest Suppression Act, 1931.

In 1932 application had to be made on or before the 31st March, but in respect of next year's export applications, in writing, for licences for 1933 must be submitted to the Department of Agriculture on or before the 31st December, 1932.

No charge is made for the licences provided application is made before the date specified. Should, however, an application be received later, the Minister may grant such licence provided the applicant undertakes to pay any expenses which may be incurred by reason of the irregularity of such application.

Wheat Growers' Exhibition, 1932.—The Third Annual Exhibition of wheat and other cereals will be held at Enkeldoorn on the 9th December. It is anticipated that the Honourable the Minister of Mines and Agriculture will open the Exhibition at 10.30 a.m.

As in previous years the Exhibition is being organised by a representative committee under the chairmanship of the local Magistrate, with the assistance of the recently formed Wheat Growers' Association.

There are numerous classes open for competition and valuable prizes are being offered by firms dealing in agricultural machinery, fertilisers, etc., throughout the Colony, and the judging will be performed by officers of the Agricultural Department.

Cotton.—While, in these days of low prices, little is heard about cotton, it is felt that this crop will make headway as soon as there are any indications of an advance in prices.

A number of growers are now finding that with lower costs of production, there is a small profit to be made from cotton where good crops are obtainable.

There is no doubt that in the U/4 derivatives which have been bred up at Gatooma, we are in possession of cottons admirably suited to the country. But for the incidence of bollworms and stainers, yields would be heavier and better than they are at present, and even at to-day's prices, would give a fair return. As it is, a number of farmers are making a small profit from cotton growing, and it is hoped that they will continue to persevere with it, if only for the sake of keeping up a supply of seed. For those areas which are distantly situated from the railway where it has been found that good cotton crops can be grown, it might be advisable to consider this crop as an alternative to maize. Cotton has the advantage of not requiring applications of artificial fertiliser, and it does not exhaust the soil.

The latest strains which have been produced at the Cotton Breeding Station give promise of heavier yields. These are being tried out in the districts this year on small

plots, but will not be available for general distribution until they have demonstrated their adaptability to the respective areas where their behaviour is being observed.

The Feeding of Dairy Cows.—An article on the feeding of dairy cows appears in this issue.

The problem before dairy farmers in the Colony to-day is to reduce the cost of production of dairy products to world levels. As far as the farmer is concerned, this can best be achieved by increasing the output of milk per cow and per acre.

Among other things, under our conditions, this calls for the maximum use of grass, the feeding of a properly balanced supplementary grain ration and the weeding out of uneconomic producers.

Recommendations on these matters are made in this article, which should be of considerable value to both the dairy farmer and the ordinary mixed farmer.

Table Poultry.—It is probable that the interest in poultry has shown greater increase during the last 12 years than that in any other branch of farming.

Up to the present, however, the production of eggs for sale has been the chief object and the production of suitable table poultry has been almost entirely neglected.

According to the latest statistics, there are considerably more than ¼ million fowls on the farms in the Colony, and there are probably almost as many on the plots near towns.

The conditions are particularly favourable for the fattening of table poultry on economic lines, and the article which appears in this issue will be welcomed by all who are interested in poultry.

It is not possible in the scope of a single article to give all the particulars that may be required, but any points not dealt with in the article can be further explained if enquiries are addressed to the Chief Poultry Officer.

Salt for Stock.—An interesting article by W. Thomson, of the Rowett Institute, appeared in the April number of the *Scottish Journal of Agriculture.*

The results of an interesting series of experiments are recorded, which indicate that in the majority of cases at least half the annual consumption of salt by cows occurred during the eighteen weeks round about the date of calving.

It is stated that no data are available regarding the amount of salt required by sheep, pigs and poultry. Indoor-fed sheep should always have access to salt, which they will freely lick without harm to themselves. The belief that salt is "poison" to pigs is difficult to understand when it is realised that pigs fed regularly on kitchen refuse, hotel swill, etc., would obviously be having their food seasoned with salt to the human taste. In present-day practice pigs are regularly fed rations containing 1 to 2 per cent. of salt, and those fed on large amounts of potatoes or maize will readily lick salt placed in their pens. In a test to determine whether salt had toxic effects, increasing amounts up to 2.5 ounces per head daily were fed to pigs without any harmful results, the animals gaining normally in weight. The danger only arises, apparently, when pigs which have not been accustomed to salt are suddenly put on a diet containing a relatively high percentage of it. Results of recent poultry experiments show that an addition of 0.5 per cent. of salt to a ration of cereals and soya-bean meal increased the growth-rate of chickens by 24 per cent., and decreased the mortality by about 17 per cent. The pullets receiving salt looked healthier and laid earlier than those not receiving the supplement.

One concludes from this study that the maintenance of perfect health among indoor-fed dairy cows is dependent on their having access to considerable amounts of salt, this being especially so round about calving time. Probably the most convenient way to administer salt is in the form of licks, and by enriching the concentrates to the extent of 2 or 3 per cent. of salt. No harm results from giving cattle, sheep and pigs free access to salt at all times. These conclusions are on the assumption that water is also available *ad libitum.*

"Grasslands of South Africa": This is the title given to the first report which has just appeared of the Grassland Research Committee, which comprises officers of the University of Pretoria and the African Explosives and Industries, Ltd.

The Committee is to be congratulated upon the thorough survey of research abroad, the grassland situation in South Africa and the complete review of the problems still awaiting solution.

An excellent bibliography is included, which should be of very great importance to anyone interested in this subject.

The section of perhaps the greatest interest is that dealing with erosion and the run-off of storm water. On a series of 10 carefully-planned plots on the University Farm it was found that during the rainy season 31.2 per cent. of the total rainfall ran off a plot which was kept bare. Only one per cent. was lost from a similar sized plot on which the natural veld grass had been left. The slope in both cases was slightly less than 4 feet in 100.

The comparative figures for a very heavy downpour, when 1.68 inches fell in 20 minutes, were 70 per cent. as compared with 1.4 per cent. It would appear, moreover, that the run-off is comparatively high on closely grazed veld, especially during heavy rains, and the importance of maintaining the natural grass cover on pastures as a means of controlling soil erosion cannot be stressed too much.

St. Dunstan's Report.—The 17th Annual Report of St. Dunstan's has just been published. It tells honestly and without sentiment of the work which St. Dunstan's has done, and is doing, for men who lost their sight in the service of their country. It deals in practical matters, with accomplished facts, it give detailed records of the daily lives of some of these men. There is a balance sheet and analysis of accounts at the end of the book. And that is all. What more need there be?

Those who think that the work of St. Dunstan's is over should read this report. They will find there details of the

Brighton Establishment, which is now a training centre, a holiday and convalescent annexe, and a home for those who, in addition to being blinded, are permanent invalids as a result of their war service.

There is the Blinded Soldiers' Children's Fund, which makes weekly allowances in respect of no fewer than 2,080 children who are not eligible for Government grants.

They will read, too, in this report of the many branches of St. Dunstan's work throughout the Empire and our Dominions.

Copies of the Report will gladly be sent on application to the Headquarters, Inner Circle, Regent's Park, London, N.W.1.

Customs Documents—Export Unmanufactured Tobacco. —Attention is directed to the fact that, as from 1st January, 1933, Customs documents relative to the export of unmanufactured tobacco must indicate clearly the class of tobacco in addition to the weight of tobacco in each class.

There will be four classes of tobacco specified under the following headings:—

"Flue Cured,"
"Dark Fire Cured,"
"Other Types,"
"Turkish."

DAIRY HERD OF MATOPO SCHOOL OF AGRICULTURE.

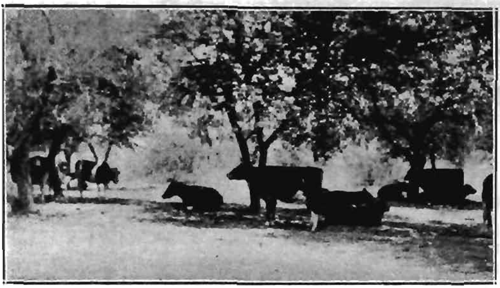


Fig. 1.—Shade is appreciated

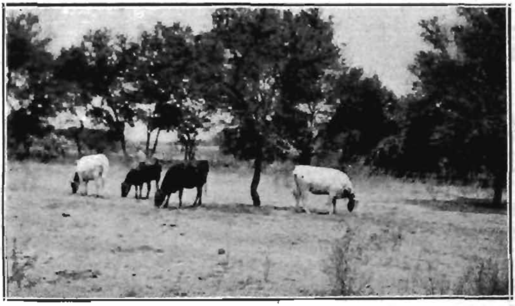


Fig. 2.—Potential producers.

Fig 3.—Dairy cows on lucerne.

SOME GENERAL OBSERVATIONS ON THE FEEDING OF DAIRY COWS ON A MIXED STOCK FARM.

By A. E. Romyn, Senior Animal Husbandry Officer.

1. Summer Feeding.—As far as the general farmer is concerned summer milk production has many advantages over winter production. The cows, for instance, generally calve with more regularity in the spring or summer months than in the winter, and there is less trouble in parturition. *On the basis of present prices summer dairying is usually* more profitable than winter dairying, and though it may be doubted whether a sound dairy industry can be built up on summer production alone, for the time being the tendency to produce as much cream as possible in the summer is justified by results.

Profitable summer production is largely bound up with the question of efficient use of the natural grazing, and the better use the summer dairyman can make of grass, the lower usually are his production costs.

The young growing grass is more valuable than matured grass, and one of his chief problems in feeding, therefore, is to conserve the "youth" of spring grass as long as possible. Experience has shown that this object can be achieved in a certain measure by keeping the grass closely *grazed and so preventing it from maturing.* If suitable paddocks are available a proper system of rotational grazing can be developed, involving the use of two or more camps, which are grazed in turn. The milking cows should get the first grazing in each paddock and be followed up by the dry stock and young cattle. The bulk of the grass should never be allowed to get more than a few inches high, and after each camp is grazed down the coarse uneaten

grass should be removed with a mower as far as possible. We have still to learn the best long-time system of pasture management for our conditions but probably, as time goes on, it will be necessary to fertilise or rest these camps periodically to maintain the stand of grass.

Long treks, especially in hot weather, are fatal to high milk yields, and a system of camping which enables proper use to be made of the grazing and keeps the cows at a convenient distance from the milking place should be developed on all farms where dairying is carried on. Fencing is in some cases as important a factor in the milk yields as good bulls.

It is difficult to exaggerate the value of any factor which makes for the greater comfort of the cows, especially where the better grade of dairy cattle is concerned, and in applying any system of close grazing care must be taken to see that the milk cows are not forced to graze down unpalatable grass or to consume short, dry vegetation late in the season when the active growth of the grass has stopped, or the milk yield will suffer.

Another important point is the provision of ample clean water in troughs, and good shelter from sun in the summer and cold winds in the winter months.

The natural pastures in some countries, and cultivated pastures in some parts of the Union of South Africa, are sufficiently nutritious to maintain a high milk yield without the use of supplementary concentrates. On Kikuyu pasture in Natal, for instance, a yield of 1,000 gallons of milk per acre has been reported, but so far the practical experience of Rhodesian farmers has been that, except in very favourable grazing areas, it is not usually possible to sustain a yield of much over one gallon per diem for any length of time unless supplementary feeding is practised. Possibly the establishment of suitable permanent pastures may make supplementary feeding unnecessary as the dairy industry becomes more specialised but, under present veld conditions, a fairly liberal scale of feeding has been found necessary to maintain a good flow of milk.

The character of this supplementary feeding should be determined by a number of factors, the chief of which are:

The nature of the pasture, the season, the value of product sold, the price of grain and the condition of the cows. Any restrictions or deficiencies in the feeding will naturally have more serious effects with good than with poor milkers.

Unfortunately, very little properly controlled work has been carried out under our conditions to determine the most economic ration or plane of feeding for cows on natural veld, and experimental work of this nature is urgently required. On the basis of our present information of the composition of "ordinary veld," a general feeding schedule for dairy cows on grass is given in the following table. It should serve as a useful guide but is *not* intended as a fixed rule to be rigidly adhered to.

Summer Feeding Schedule.

		Amount of each feed in 100 lbs. of concentrate mixture.						Amount of each ration required per day.	
Months of year.	No. of ration.	Maize meal.	Sunflower-head meal.	Groundnut meal (whole plant).	*Groundnut meal* (kernels only).	Cotton seed or undecorticated cotton cake.	Decorticated groundnut cake.	Production of cow, in gallons, per day.	Amount of grain ration, lbs.
October ...	1	100*						1	*Nil*
	2	75	25					2	2
November...	3	75		25				3	5
	4	90			10				
December...	5	90				10†		4	9
January ...	1	75					25	1	*Nil*
	2	60	20				20	2	3
February ...	3	60		20			20	3	6
	4	65			20		15		
	5	60				20	20	4	10
March ...	1	70					30	1	2
	2	50	25				25	2	5
April ...	3	50		25			25	3	8
	4	60			20		20	4	12
	5	50				25	25		

* Not generally suitable where more than 5 lbs. per day has to be fed.

† Cotton seed alone or crushed cotton seed mixed with an equal proportion of maize meal is a satisfactory feed for dairy cows in the earlier part of the season and can be used instead of the mixture given. The cows should be accustomed gradually to the seed. Quantities up to 5 lbs. of cotton seed per day can usually be fed with safety.

The proportion of purchased feed, groundnut or cotton cake in these rations is considerable. The most practical way to reduce these purchases, without reducing the milk yield, is to improve the quality of the pasture so that it does not fall below, say, the January standard until much later in the season. As indicated previously, this object may be achieved by better pasture management or by the establishment of improved pastures. The resultant saving on bought feed and of concentrates is a cogent argument for the improvement of pastures.

The progressive decrease in the protein content and the feeding value of the ordinary grazing as it matures is compensated for in the rations suggested by the progressive increase in the protein content and the amount of the grain ration. Thus, a cow giving three gallons of milk in December might receive 5 lbs. of, say, ration 3, which consists of maize meal 75 lbs., groundnut meal (whole plant) 25 lbs.; whereas a similar cow producing three gallons of milk in March, would have to receive 8 lbs. of a modified grain ration No. 3, which contains maize meal 50 lbs., groundnut meal (whole plant) 25 lbs., groundnut cake 25 lbs. to maintain a similar production of milk.

During the latter part of April and the early part of May, such succulent feeds as green maize, sweet potato tops and silage, saved from the previous season, are of great value in maintaining the milk yield when the grass becomes short, dry, or unpalatable.

In the case of cows which produce normally over three gallons of milk per day or during dry seasons, it may be advisable to change over to the "increased mixtures" a month earlier than is recommended in the table. It is very difficult to bring about a recovery once there has been a drop in the milk yield, and it is very unwise to postpone supplementary feeding, especially near the commencement of the winter, until the stock show a distinct drop in milk yield or condition. The condition of the cows and their production of milk should, therefore, be watched closely at this time to see when change in feeding is necessary.

Bone meal and salt should be added to the ration of dairy cows; each cow in milk should be allowed 3 to 6 oz.

of bone meal and 1 oz. of salt per day. These amounts are given most conveniently by mixing the bone meal and salt in suitable proportions with the grain ration. Failure to provide sufficient minerals will result in a drop in the milk yield, irregularity in breeding and loss of condition.

The amount of grain fed to the cows should be based closely on their milk production. Supplementary feeding cannot be carried out on the most economic lines unless the production of each cow is known and its feed regulated accordingly. The milk scale is a necessary adjunct to scientific feeding and, where the farmer does not record his cows under one of the official or semi-official schemes, he should take steps to keep adequate private records to enable him to see what each cow is doing. To do this it is necessary to hand-rear all the calves.

2. Winter Feeding.—The cream producers who make the most profit out of winter dairying are usually those with cows of high production, which normally milk over the summer into the winter season, or those who are raising breeding stock for sale and need a good record to sell their heifers to advantage. Provision should be made, however, on practically all dairy farms for some supplementary feeding in the winter.

It is generally necessary to adopt a full winter feeding schedule in May or June to maintain the condition of the cows intended for production during the winter, and, to avoid feeding temporarily unprofitable cows, it is usually advisable at this time or earlier, to dry off any cows far gone in their lactation, only keeping on those milking over, say, 1½ to 2 gallons per day, depending on circumstances. The milking of cows suckling calves should also be stopped at this time. Feeding for production in the winter months is expensive on account of the lack of sources of cheap farm protein. Protein feeds commonly available on the farm at this time are groundnut meal (either the whole plant or the kernels only ground into meal), cotton-seed, sunflower meal, cowpea, dolichos or velvet bean hay and mixed silage—maize planted with some leguminous crop such as dolichos or velvet beans. Recent work indicates that grass silage

properly made may turn out a satisfactory winter succulent with a fair protein content, but more experience in the making of grass silage under our conditions is necessary before it can be safely adopted as a general feed. The meals and hays just referred to, on account of their low yield, are comparatively expensive sources of protein, and at present market values compare unfavourably with the bought protein concentrates such as decorticated groundnut cake or ordinary cotton cake. The production of sunflowers and the leguminous crops just mentioned fits, however, into the general farming system and carries certain supplementary benefits which seem to make their cultivation on a limited scale a wise policy, and each individual farmer should decide for himself whether it is better to increase his acreage of these crops or to buy cake.

It is generally necessary to purchase a protein concentrate to sustain a milk yield of over two gallons under our conditions and, though in other countries there is a wide range of these concentrates to choose from, under local conditions the choice during the winter months is practically limited to groundnut cake. Wheaten bran is a valuable feed but too expensive for general use. Both cotton seed and undecorticated cotton cake are too low in protein to balance a ration for high producers unless a palatable legume hay is available, which is all too seldom. Cowpea grain when added to the grain mixture in fairly large proportions has given indifferent results. Sunflower meal, if used in the grain mixture in a larger proportion than 25 per cent. by weight of the total mixture, makes a ration which is too bulky for high producing cows. Dolichos beans and velvet beans are somewhat indigestible and unpalatable, and cannot be used in sufficiently large proportions to build up the protein content of the ration to the level required. The choice, therefore, narrows down to groundnut cake in the winter and groundnut cake or cotton cake in the summer months. This concentration on more or less one feed has certain economic disadvantages, and dairy farmers should keep in close touch with the groundnut and cotton cake market to ensure that provision is made for reliable supplies to the industry at a reasonable cost.

A primary consideration in making up a feeding schedule for dairy cows in the winter months is the availability or otherwise of a legume hay.

Where a palatable legume hay is available in sufficient quantity, the foundation of the grain mixture should be 300 lbs. of maize meal to 100 lbs. of groundnut cake. When such a hay is not available, the proportion of cake should be increased to 150 lbs.

Other feeds, such as sunflower meal, groundnut meal (whole plant), cowpea meal, wheaten bran, velvet bean meal (pods and seeds ground), should be added to this foundation either singly or in combination to make up not more than 25 per cent. of the total concentrate ration by weight. They add to the palatability of the ration and by increasing the number of component feeds, tend to produce a better balanced mixture. General experience up to the present does not favour the addition of a greater proportion than 25 per cent. by weight of these feeds, but each farmer should work out for himself whether it is a better financial policy to buy more "cake" for his cows or to be content with a lesser milk yield.

Three to four pounds of the foregoing mixture per gallon of milk produced is generally taken to be the optimum rate of feeding. The higher figure should be used where the milk is of rich quality or the roughages are of poor quality. For cows giving less than two gallons of milk per diem, or where it is desired not to force the cows for maximum production, it may be profitable to follow a lower scale of feeding. Under our conditions, however, a lower plane than the one recommended frequently results in the early drying off of the cows. Abrupt changes in the character of the ration should be avoided, as they tend to upset the cow.

It is usually not necessary under our conditions to limit the amount of roughages fed to the cows, or to prevent them from picking up what grazing is available in the winter months. A normal allowance of hay is 7-10 lbs. per head per day. If this hay is a legume, the proportion of "cake" in the concentrate ration can be reduced as already indicated.

Twenty-five to thirty pounds of silage, depending on the size of the cow and the amount of hay fed, or a proportionately greater weight of majordas or pumpkins is a normal allowance of succulent feed in addition to the hay. These succulent feeds are of great value in maintaining the thrift of the cows during the dry months of the year.

Where a suitable vlei or a land under irrigation is available, valuable supplementary grazing can often be obtained from the green grass or on green oats or barley; and the preliminary results obtained by this Department from the establishment of winter grass pastures on vlei soils hold out promise that pastures of this nature may help a great deal in the solution of the winter feed problem in Mashonaland. A small acreage of lucerne is often an invaluable asset.

Finally, the mixed dairy farm is incomplete without pigs. In specialised dairying countries it is often stated that the net profit on the dairy business is the separated milk which is fed to the pigs. Separated milk, butter milk and, to a lesser extent, whey are very valuable feeds for pigs, and dairy farmers who manage their pigs properly find that the pig substantially increases their financial return per gallon of milk.

Under present conditions a dairy farmer should plan to keep one breeding sow to every four to six cows in his herd.

HANDBOOK OF TOBACCO DISEASES.

Attention of readers is drawn to the fact that the Department of Agriculture has found it most inconvenient, with the present shortage of staff, to handle the local sales of this book. Arrangements have therefore been made with the Rhodesian Printing and Publishing Company for distribution by them throughout Southern Rhodesia. The book may be obtained from the Herald Store, Salisbury, price 4s., or, postage paid, 4s. 4d.

IMPROVED PASTURES AND GRAZING EXPERIMENTS.

By The Division of Plant Industry.

After a number of years of preliminary trial with numerous hay and pasture grasses—both indigenous and exotic—it was decided during 1929 to establish on the Agricutural Experiment Station, Salisbury, small paddocks of Woolly Finger grass (*Digitaria pentzii*) and Hunyani grass (*Chloris gayana* var.), these appearing two of the most promising.

Hunyani grass is a native of Rhodesia and in many respects is much like Rhodes grass but produces surface runners very much more luxuriantly. It does not seed as freely as Rhodes grass and is difficult to establish by this means.

The land selected for the paddocks had been under cultivation for eighteen years, during which time it had been cropped chiefly to maize. The section on which Woolly Finger grass was planted had received a dressing of 12 tons per acre of farm manure the previous season, and a further 200 lbs. per acre of bone and superphosphate was broadcasted before the grass roots were planted. The land on which the Hunyani grass was established had had no manure or fertiliser for several years, and on this section bone and superphosphate was applied at the rate of 400 lbs. per acre prior to planting of the grass.

Each paddock was two-thirds of an acre in extent and both were planted on 29th November, 1929, the grass roots being spaced 40 inches x 18 inches apart. As a result of favourable weather conditions, over 90 per cent. of the transplants became established and at the end of the season the Hunyani grass had practically covered the entire ground, while the Woolly Finger grass had covered about three-quarters of the space between the rows.

Hunyani grass was grazed by cattle during the following winter, but Woolly Finger grass not being then considered ready for grazing, the summer growth was cut and removed from the field.

Treatment and Results, 1930-31.—With the advent of warm weather in the spring of 1930, growth commenced on the Woolly Finger grass paddock, and by mid-December the runners had completely covered the bare patches which had not been filled during the previous season. Hunyani grass did not commence its spring growth as early as Woolly Finger and for that reason it could not be grazed until two or three weeks later than the latter. At intervals during the summer and following months, several head of cattle were intermittently grazed on the pastures as circumstances justified, and in the tabulation below are shown the number of *ox-grazing days which each paddock provided each month.

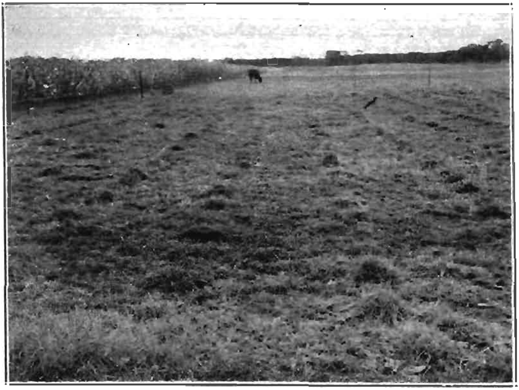
Kind of grass.	Dec.	Jan.	Feb.	Mar.	July.	Aug.	Total for ⅔ acre.	Equivalent for 1 acre.
Woolly Finger grass	30	12	49	36	40	—	167	250.5
Hunyani grass	—	54	101	—	—	40	195	292.5

During the period December to March, the cattle received no supplementary food, and the results indicate that under the conditions pertaining to this experiment the carrying capacity of these grasses during the summer months was from 1.5 to 2 head of adult cattle per acre. An even longer period of grazing would probably have been provided if the seasonal rains had continued as they normally do, until the end of March.

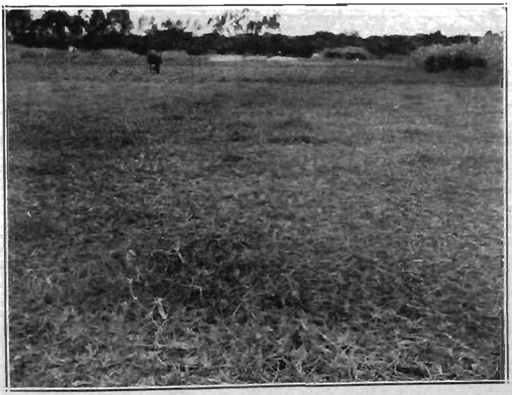
During October, 1931, the paddocks received superphosphate (19 per cent.) at the rate of 200 lbs. per acre, and later, one-half of each received a dressing of 100 lbs. per acre of sulphate of ammonia. It may here be mentioned that, contrary to expectations, the application of nitrogen exerted no observable influence on growth or palatability.

About this time it was to be seen that large patches of the Hunyani grass had apparently died out over about

* By *ox-grazing days is meant the number of days of grazing which would have been provided for one ox, or alternatively, the number of oxen for which the paddock would have provided grazing for one day.*



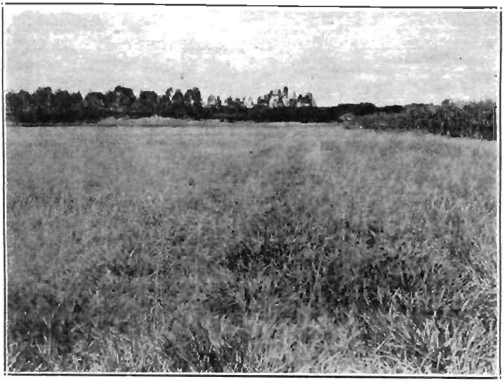
Woolly Finger grass after being fairly closely grazed.



Hunyani grass. Paddock heavily grazed.

Gonya grass (*Urochloa trichopus*). This is a finer-leaved grass than *Urochloa bolbodes*.

Gonya grass (*Urochloa bolbodes*) in full growth.



Creeping False Paspalum (*Brachiaria dictyoneura*) in flower.

Purple-top Buffel grass (*Panicum maximum*) in full flower in background.

one-quarter of the paddock. No definite cause for this could be ascertained and it can only be presumed that termites were mainly responsible. However, by means of its rapidly-spreading surface runners the grass re-covered the bare patches within a few weeks of the commencement of the rains. Woolly Finger grass did not suffer any serious ill-effects from either termites or the winter drought.

Results during 1931-32.—It was decided from this time onward to conduct the experiment as an intensive grazing trial to test the respective carrying capacity of the two grasses, and in consequence on the 30th December, 1931, one large adult ox was placed in each paddock and kept there continuously without other food. Both animals gained weight rapidly, and after 2 to 3 months had attained as high condition as is usually associated with good, grass-fed slaughter cattle. This condition was maintained for several weeks, but towards the end of May the beasts began to lose weight. During July the ox on the Hunyani grass repeatedly broke through the fence to the Woolly Finger grass paddock, thus indicating that it found that grass more abundant and palatable than its own. Owing to the absence of further grazing, this ox was removed from its paddock on the 23rd July, and, although as yet it had shown no sign of discontent, the ox on the Woolly Finger grass was likewise removed six days later, as it was feared that a longer period of grazing might injure the grass and delay its recovery the following season. This animal had been solely maintained without any supplementary food for 7 months on two-thirds of an acre (equal to 318 days for 1 acre) of Woolly Finger grass.

Although it is not possible to draw definite conclusions from results obtained from single plots and single animals, the experiment seems to indicate that the carrying capacity of Woolly Finger grass is somewhat greater than that of Hunyani grass and that it is also more palatable during the winter months, a characteristic which enhances its value. It would, therefore, appear that when the provision of pasturage is the main object, Woolly Finger grass may be the more desirable since it grows steadily and persistently over a longer period and its short, dense, leafy herbage is

nutritious even when dry. On the other hand, if it is desired to preserve the summer growth of grass in the form of hay or silage, Hunyani grass may be preferred, its upright habit of growth providing a good and weighty cut for either purpose. It may be mentioned at this stage that the roots of Hunyani grass do not travel well or transplant as readily as those of most other grasses of similar type, and before extensive planting can be contemplated, a nursery of Hunyani grass should be established on the farm.

Extension of Grazing Trials.—A further series of two-thirds of an acre paddocks were laid down in November, 1931, to (a) Creeping false paspalum (*Brachiaria dictyoneura*), and (b) Reed Timothy (*Setaria phragmitoides*) underplanted with Woolly Finger, Hunyani grass, and creeping false paspalum. Two other paddocks were established by means of seed to Purple-top buffel grass (*Panicum maximum*) and Gonya grass (*Urochloa trichopus*) half plot, and (*Urochloa bulbodes*) half plot.

The area chosen for these extensions had been under cultivation for some twenty years and being somewhat reduced in fertility it was deemed advisable to fertilise the whole with 200 lbs. per acre of superphosphate before establishing the grasses.

Favourable climatic conditions resulted in a very good cover being secured from the species established from root-divisions, and being sufficiently well established to permit of grazing, a large adult ox was placed on each of the (a) and (b) paddocks referred to above on the 8th June, 1932, with a view to ascertaining their respective carrying capacities during winter.

In August, however, an unusually heavy fall of rain, totalling nearly two inches, enabled the grasses to make unusual growth, and at the time of writing, 10th October, the animals are still in these paddocks, and although they have not received any supplementary food, their loss of weight has so far been very small. A ration of bone meal and salt was given from the 1st September, 1932.

Grasses Established from Seed.—The grasses established from seed, namely, Buffel and Gonya grass, made much

slower progress in the beginning of the season than those laid down from root divisions. This is largely attributable to the slow initial growth of the seedlings of our perennial grasses and to the intermittent droughty conditions which prevailed for some 6 to 7 weeks after sowing. Germination was somewhat irregular, successive batches of seedlings appearing from time to time. The plantlets, however, proved hardy and capable of resisting hot and dry weather lasting for periods of two or three weeks, and when favourable weather arrived they grew rapidly and eventually produced a luxuriant growth which might have been taken for hay, and later a large quantity of seed. Owing to the uneven ripening of the crop it was not possible to harvest all the seed, but from the Purple-top buffel a yield of 400 lbs. per acre was obtained, and 200 lbs. per acre of Gonya grass seed. A considerable amount of seed was allowed to shed itself with a view to thickening the stand the following season.

During June and July, by which date frost and drought combined had browned off the greater part of the herbage, cattle were allowed to graze these two paddocks and the leafy portions and much of the remaining parts of the seed culms were readily eaten. The number of grazing days per acre for one head of cattle provided by these grasses was as follows: For the Purple-top Buffel 237 days, and for the Gonya grass 201 days, but since the cattle received a small amount of supplementary roughage the results are not strictly comparable with those recorded for the other paddocks. Owing to a scarcity of seed and, therefore, a thinner sowing per acre, Gonya grass was not established as thickly as was Buffel grass, and this may account for the fewer number of grazing days it provided.

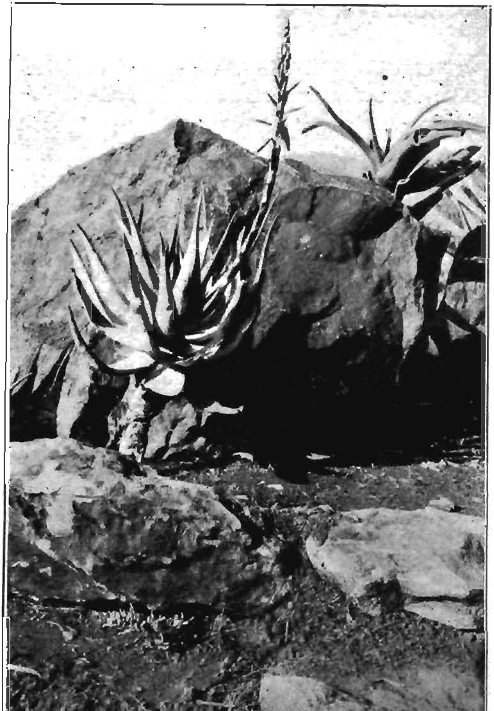
It is desired to emphasise that before these experiments can be considered complete, they must be continued for several more years, and that the results as far as they go are applicable only to the conditions under which the tests have been conducted, viz., on red diorite soil, fertilised to restore in some measure its depleted fertility, and with a rainfall of 25-30 inches spread over the summer months. The very abnormal rains of August, 1932, were unfortunate from the point of view of the experiment, causing as they

did a quite exceptional spring growth, which has provided more grazing during the past September and October than could usually be looked for.

The investigation, so far as it has proceeded, throws considerable light on the possibilities of establishing improved pastures which, when well managed under a rotational system of grazing, will afford a considerably higher carrying capacity than the unimproved veld. More extensive experiments under different conditions of soil and climate are, however, desirable and it is hoped that farmers who have already established nursery plots of the more promising grasses supplied by the Salisbury Experiment Station will extend their acreages and give the resulting paddocks careful attention. Those who have not yet established nurseries are invited to take advantage of the supplies of Woolly Finger grass roots offered for sale from the Station during January and February at a cost of 10s. per sack of roots delivered free at nearest railway station or siding. Planting material of other desirable grasses, including Creeping false paspalum and Swamp couch (*Haemarthria fasiculata*) —one of the best grasses for vlei soils—can be supplied in small quantities, free of charge, to permit of the establishment of nursery plots.

H. G. M.

A. macrantha.



A. lineata.

A. microstigma.

NOTES ON AFRICAN ALOES.

By H. Basil Christian, Ewanrigg, Arcturus.

PART IV.

Aloe macrantha.—*Aloe macrantha* is one of the numerous spotted leaf aloes which are so much alike in general appearance that it is impossible for even a trained botanist to identify some of them with certainty when not in flower.

It occurs in Natal.

It is an acaulescent plant which increases by means of underground runners, which throw up new plants at a distance from the parent.

The leaves are broad at the base in proportion to their length; they are green, or in the dry season of a brownish tinge, with oblong whitish blotches on the upper surface; the under surface is of a paler green with indistinct longitudinal lines; the margins are armed with rather large, sharp prickles, but there are none on either upper or lower surface.

The peduncle is smooth and branched, reaching a height of 30 inches, and terminates in somewhat capitate heads of yellow flowers.

It flowers freely under Southern Rhodesian conditions in April and May, and again in July.

Aloe microstigma.—*Aloe microstigma* occurs in the Grahamstown and Addo districts of the Eastern Province of the Cape, also at Hex River. It is rather a small acaulescent or sub-acaulescent plant with a dense rosette of leaves, which are erect and incurved; they are light green tinted with liver red colour and are copiously studded with whitish oblong spots on both surfaces; the margins only are armed with small brown thorns.

The inflorescence grows to a height of 2 feet to 2 feet 6 inches, and terminates in a conical raceme. The buds and flowers are at first pale pink and later become bright pale yellow and pendulous.

It flowers freely under Southern Rhodesian conditions from June into August, often throwing up a fresh flower spike as the first dies off. It has not the suckering habit.

This aloe can be obtained from the Winton Nurseries, Bonnievale, Cape Province.

Aloe lineata.—*Aloe lineata* occurs in the Eastern Province of the Cape in the neighbourhood of Grahamstown.

It has a short stout stem from 2 feet to 4 feet high, rarely up to 7 feet. The upper part of the stem is usually covered with the remains of the old leaves.

The leaves are in a dense rosette rather short and upright; they are bright green or slightly glaucous and distinctly lined on both surfaces—hence its specific name—and armed along the margins only with brown prickles.

The inflorescence is stout and unbranched and terminates in an elongated conical raceme of bright red flowers, which become pendulous when fully mature.

It appears to be a shy flower under Southern Rhodesian conditions. It suckers freely from the stem, not the base and it is, therefore, easy to increase one's stock rapidly.

POULTRY INDUSTRY.

THE REARING AND FATTENING OF TABLE POULTRY.

By H. G. Wheeldon, Chief Poultry Officer.

The demand for good table poultry is a consistent and growing one. Owing, however, to the fact that the majority of producers in Rhodesia concentrate on egg production, the supply of desirable table poultry often falls short of the demand. Householders in the past have been perforce content with native hawkers' stock without realising the possible existence of disease in a latent form or the poor value of such purchases. It is not surprising, therefore, that many people now demand well-fed table fowls of better value from reliable sources. This is gratifying, as the development of the industry depends so much upon the discretion exercised by the consumer, and the changed attitude is already having a stimulating effect on the table poultry business in Rhodesia. There are at present in this Colony producers who are concentrating on the production and sale of better quality birds, and these producers deserve all the encouragement possible. On the other hand, it rests with the producers to assure the consumer regular and continuous supplies. Careful attention to the proper preparation of table poultry will be amply repaid, for the discriminating consumer considers both appearance and quality. The ultimate success of the enterprise will depend to a great extent on the condition in which the products are marketed. The appearance of the birds, whether alive or trussed, has an important bearing on the demand and the price received.

The production of ducks and turkeys for table purposes should not be lost sight of, as these serve to maintain regular supplies of desired quality.

It should be pointed out for the benefit of those raising ducks and turkeys that it is most essential, apart from anything else, to breed from standard size stock, for unless this is done it is very doubtful whether the progeny can be raised economically and profitably for disposal to the best advantage.

Throughout the country there are dozens of egg farmers, and although it is a fact that heavy or dual-purpose breeds often form the source of supplies, light breeds are frequently kept for egg production. Every breeding season finds the producer with hosts of young cockerels, which provide a marketing problem and in consequence it has been customary in the past to destroy the male chickens as the sex is distinguished at an early age. It is suggested, however, as an alternative, that surplus cockerels can be to some extent economically converted into a profitable source of income.

Marketing.—In the more developed countries, fattening is a special industry, and a flourishing trade exists in fattened birds. It is a well-known fact that few fatteners actually raise the stock themselves, there being a sufficient margin of profit between producing and marketing to cover the fattening costs. Much can be done, however, in the production of fattened poultry without cramming or other special methods of fattening.

To establish a steady retail trade requires time and tact, and the best advertisement is a satisfied customer. The wholesale business, on the other hand, is easier to get and easy to serve, but it may be taken as a general rule, that the nearer the reach to the consumer the greater is the tact and business knowledge required and the profits are greater. The largest profits are derived from better marketing and from special market advantages in selling the stock.

The commercial egg farmer usually caters for the live poultry market and with the exception of a small trade in trussed poultry, a large number of the poultry sold for consumption in Rhodesia is marketed alive. This practice requires less time and equipment, an important consideration when commercial egg production is the main object. The sale of live poultry is based largely upon weight and to a less extent upon the quality, provided the birds are young, and the care in preparing live birds is thus reduced to a

minimum. The disposal of live poultry is more satisfactory over long distances. The demand for trussed poultry is based mainly on quality and appearance. The latter fetches a higher price per pound, but the killing, plucking and trussing requires experience and considerable time. As the shrinkage in weight of live poultry en route to distant marketing centres is approximately 10 per cent., and as a similar loss in weight is experienced in the trussing process, the choice of trade depends to a large extent upon the proximity to markets. The poultry farmer must decide for himself which is likely to be the more suitable under his own particular circumstances.

In considering the methods to be adopted for the production and disposal of table fowl in this country, it is necessary to mention that the supply of good poultry is seasonal and is not uniform throughout the year. Chickens are hatched and reared normally from April to September, and the surplus young stock available for sale would not reach high proportions until about October and would not continue much beyond January. The seasonal and irregular character of supplies will become of greater importance as the demand increased unless the breeding season is spread over a longer period or other means are adopted to ensure more uniform distribution. Cold storage plays an important part in holding the surplus off the market and thus balances the supply and demand, but storage is unfortunately at present out of the question, as it increases the cost to such a great extent. Under such circumstances it becomes necessary for the producer to endeavour to distribute his supplies by other means, which involve different methods of handling the snrplus poultry. For instance, the disposal of cockerels alive by egg farmers is feasible at the age of six to eight weeks, when the sex is distinguishable, and although a supply of eggs for market is the main object, an attempt might be made to encourage a demand for surplus cockerels at this early age. These birds will weigh 1½ lb. at eight weeks old and can be retailed by producers as fryers or disposed of in wholesale lots usually to grain farmers or plotholders in the vicinity of the markets who can either retail or rear these chickens economically to meet the required demand. The hens that have completed their second season

should be reduced in number as soon as possible after the breeding or laying season and disposed of rather than retained through the plentiful period of egg production. The early disposal of these birds should meet a favourable demand at a time when roaster-cockerels are scarce. Lastly, it is suggested to those who can keep their birds economically for 10 months it might be expedient to caponise a number of cockerels each year and such de-sexed birds held over during the flush season if necessary to facilitate the spreading of supplies over a longer period of the year.

The production of table poultry is in a large measure dependent on market requirements and the stock for disposal may be classified to the best advantage as follows:—

Broilers.—In the event of not being able to dispose of all the cockerel supplies at an early age, they should be placed in colony houses and raised for sale as broilers at the age of 12 to 14 weeks. If the birds are well fed, this practice possesses possibilities on many farms for a retail or wholesale trade. At the Salisbury Experiment Station it was found that young cockerels of this grade can be raised profitably. They are usually plump and well grown when fed ordinarily on chick rearing rations and they should weigh from 2¼ to 3¼ lbs. each or 27 to 39 lbs. per dozen. Such stock can be sold alive or if trussed in pairs or separately neatly packed in cartons. The larger grades of table chickens can also be produced in plump condition though unfattened to meet the local demand if well-fed, without special or crate fattening methods. Young growing stock should be marketed in three different stages, namely, plump or unfattened chickens, trough fed or half fattened chickens, and fully fattened or crate fed chickens.

Capons.—The supply of cockerels by producers can be spread over a greater part of the year if converted into desirable though larger table birds by caponising. In order to lengthen the period of marketing, the production of capons is well worth consideration. The capon does not deteriorate in quality with age, and it may be kept for a reasonable period and sold to best advantage at a time when suitable birds are scarce. They make a palatable roast, and if plump should meet with a ready out-of-season demand in this

Fig. 1. Caponising. The site of the operation is indicated.

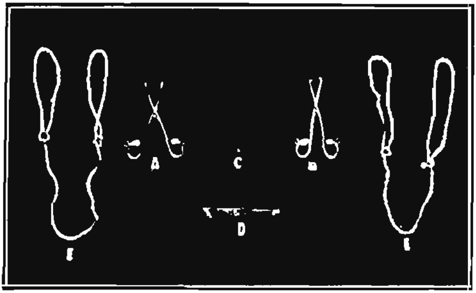


Fig. 2. Caponising. Instruments required.

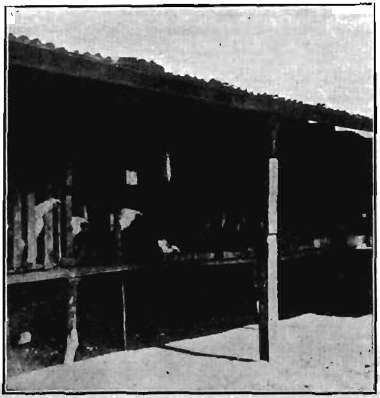


Fig. 3. Fattening crates.

country. The capon becomes docile and loses all inclination for fighting and they can be suitably housed in flocks of 25 birds. By colonising these birds in suitable localities where they can have access to shade and food by foraging this would reduce costs and the expense of fencing. Capons are usually plump and they are light feeders and under suitable environmental conditions, favourable uninterrupted thrifty growth can be expected.

Mature Fowls.—It is necessary to reduce the flock of mature stock by the usual seasonal process of culling. There are also some farmers who desire to limit their egg yield during the flush season of production, and who wish to reduce accordingly their laying flocks of mature stock. Culled hens, if well fleshed as they are usually, make excellent eating when braised. If some of the culled stock is lean but healthy it would be advantageous to producers to retain and fatten any such stock before disposal. This can be done satisfactorily by placing them in crates or small pens and trough fed for a period of one to two weeks. The feeding should consist of moist mash preferably mixed with sour milk or an extra supply of grain will frequently suffice for birds in colony houses. These methods of feeding can be applied generally to all classes of lean poultry which require the finishing touches for ordinary table purposes. The stock offered for sale should at all times be selected according to their condition.

Ducks and Geese.—Ducks are amongst the quickest maturing of all table birds. They are easy to rear and for young fat ducks about 10 to 12 weeks old there is a ready demand. At this age the flesh is palatable and tender and realises a comparatively good price. Up to this period the gain in weight is more economically produced and all ducks intended for table purposes should be sold at that age. The demand for geese is very limited in our warm climate, but they are kept by some farmers for the sale of "down."

Turkeys.—There is usually a good demand for turkeys at Christmas. In the writer's opinion, however, it should be possible to build up a demand throughout the year for young fat toms and poults weighing 6 to 8 lbs. each. It is usually considered that turkeys are fit for consumption

only when they are mature, but young turkeys weighing 3 to 4 lbs. each are favourably commented upon by customers as being better than mature birds. In view of this there are possibilities of a growing demand for young turkeys throughout the year.

Best Breeds for the Purpose.—The suitability of any breed for table poultry production is in a large measure dependent on market requirements and on the extent to which chickens of any breed can be produced to meet the size and quality demanded at the most economical cost.

Information is often sought in regard to cross-breds. The merits of pure-bred stock are well worth considering, because the pullets can be sold for egg production or for breeding purposes. In any case, in comparing the heavy or general purpose breeds and cross-breds with the light or egg-producing breeds, there can be no doubt that the former have the advantage if the production of table chickens is the main objective. The cost of feeding is practically the same. The general purpose and cross-breds are better than the egg breeds in an unfattened condition at a time when taken from the Colony houses in the early season, but this is not always maintained as the chickens grow older. They do better also when trough fed, as they are more docile and less active, but this difference is not always well marked in crate feeding or cramming. In marketing, the superiority of the larger breeds may again become more apparent but the demand for smaller birds, which is a growing one, must not be lost sight of.

The best results can be secured only from the use of strong, healthy, vigorous stock, such as Sussex, Rhode Island Reds and Wyandottes. Any of these and the Orpington crossed with the game varieties make plump chickens, which are well breasted at any age and will fatten readily.

Fattening.—The object of fattening poultry for market is twofold; first, to obtain a gain in weight, and, second, to improve the quality of the flesh. Although the stock will usually retain their plump condition up to the age of 16 weeks, the flesh tends to become firm and hard after that age. The fattening of cockerels may commence at the

age of 16 to 18 weeks and should consist of liberal feeding with limited exercise. It may be said that poultry are fattened to a less extent than probably any other class of live stock. The marketing of poultry, especially trussed poultry, requires considerable improvement before the conditions are ideal. As already inferred, the stock offered for sale should be selected with a view to marketing those that are in good condition. The finishing touches to marketable products yield the best return on the average farm.

Range Fattening.—When the poultry farmer undertakes to fatten his poultry, the most common method employed is range fattening. This method consists of feeding more liberally or supplying a greater proportion of grain, which is likely to produce flesh before the birds are marketed. No other change is made in the care of the birds, and they can be colonised or allowed free range. Such a method of feeding is economical and will result in a gain in weight, especially if the birds were previously in lean condition.

It cannot be expected, however, that if cockerels are permitted to run about they will ever increase in weight to the same extent as when they are kept in confinement. In many parts of the country "half fattened" birds would be more profitable to produce at first by reason of the fact that consumers in most cases are not prepared to pay the price for fully fed birds.

With certain classes of poultry, such as the turkey and guinea fowl, this is the most practical method of fattening, for these birds are semi-wild by nature, and if confined to pens for fattening they are likely to go off their feed after a few days, resulting in loss of weight rather than gain. When turkeys have free range they will fatten on their own accord at certain seasons of the year and will not need a great amount of supplementary feeding.

Pen Fattening.—Where an effort is made to supply better class poultry direct to the consumer, the fattening may be carried out in pens. In fattening fowls or ducklings in large numbers, they may be confined in pens with a small run, and fed heavily a fattening ration (moist mash) for a period of two to three weeks. This method of fattening is suitable and should be adopted for trough feeding chickens,

ducklings and geese. Water fowl fatten very readily in pens; they should not be provided with water for swimming. The flock should not exceed 20 to 30 birds and allow 2 square feet of floor space for each bird. The food troughs should be constructed to prevent the birds from standing on the food.

Crate Fattening.—In crate fattening the birds are confined in crates. This system is adopted to produce the best quality table birds. Vigorous, healthy cockerels should be selected for this purpose and should be in moderately good condition as they would be, ordinarily, on chick rearing rations or after range and pen fattening. On placing the birds in fattening crates, they should be thoroughly treated with insect powder and the treatment should be repeated once or twice during the feeding period. Fowls infested with lice do not fatten well when confined. The birds should be fed sparingly at the commencement, and the first feed should contain Epsom Salts. The salts should be dissolved in water at the rate of 2 oz. to 1 gallon of water, and this solution used to mix a moist mash. This should constitute the first feed during the first 24 hours after the birds have been placed in the crates. Thereafter the birds should be fed two or three times a day but kept moderately hungry during the first week. As the birds become more settled in the crates, the quantity of food may be increased to a full feed three times a day. The quantity of food must be gauged in such a way that the food will be readily consumed within a reasonable time to satisfy the birds. They should have sufficient to satisfy them and yet not quite as much as they could consume; this stimulates their appetite. The food should not be left in the trough from one feed to the next. This is particularly important even when the birds are fed twice a day, except in this case they might be allowed a longer time to consume each meal. If it is more convenient to feed twice a day, the birds should be fed morning and evening.

The length of time required to fatten, depends on the individual birds, as some birds will stand feeding for longer periods than do others. It takes about two to three weeks as a rule to change the quality of the flesh, but some birds cannot stand this feeding for more than 10 days. The birds

should in any case be disposed of when they are noticeably off their food. Although it is possible to feed some birds under this system for 4 to 5 weeks the best gains are made during the first two or three weeks as a rule.

The Crate.—The design of crate commonly used in crate fattening is 6 feet long 2 feet wide and 18 inches high, with partitions 2 feet apart. The crate is thus divided into three compartments 2 feet square. In some cases it is made with two compartments each 3 feet long. The crate can be covered on all sides except the front with 1 inch mesh wire netting, or with slats. The front should be closed with slats placed vertically, 2 inches apart. A dropping board may be provided underneath the compartments and a galvauised iron trough is provided along the front of the crate for feeding purposes. The troughs and dropping boards should be detachable. The crate should be portable but elevated and supported 2 feet from the ground. Each compartment holds 4 adult birds or 6 birds at 14 weeks old. If the compartments used are 3 feet long increase proportionately the number of birds to be confined. The crates should be situated in a cool shady place in hot weather and in a comfortable sheltered position in cold weather.

Feeding.—On removing the chickens from the incubator to the brooders they should be fed on the usual chick rearing rations. They may be allowed constant access to the mash and the hoppers should be constructed to avoid wastage.

The following ration is recommended for rearing heavy and light breeds of poultry:—

Mealie Meal	45 lbs.	
Bran	10 lbs.	
Pollard	17 lbs.	
Oats (rolled or meal)	10 lbs.	
Monkeynut Cake	10 lbs.	
Meat or Blood Meal	8 lbs.	(to 12 weeks)
Bone Meal	2 lbs.	
Limestone or Powdered Oyster Shell	1 lb.	
Charcoal	1 lb.	
Fine Salt	½ lb.	

For the first 12 weeks it is desirable to add about 8 per cent. blood meal or meat meal unless thick separated milk is available, when this may be reduced to 5 per cent.

An ample supply of finely chopped green food should always be available, as is also the case with grit, oyster shell and charcoal.

For a grain mixture, munga may he fed alone from the time of hatching until the chicks are eight weeks old, thereafter six parts of crushed mealies should be added to every four parts of munga.

When it is desired to extend the breeding season for the production of table birds and for the rearing of out-of-season hatched chickens, especially those hatched during October and subsequent months, a stimulating ration is required to increase the growth-rate of such stock. This would be effected by increasing the amount of animal food from 8 per cent. to 12 per cent. in the mash ration.

Fattening Ration.—The following rations for fattening both young and old stock are recommended:—

With milk.		Without milk.	
Maize Meal	55 lbs.	Maize Meal	55 lbs.
Pollard	20 lbs.	Pollard	20 lbs.
Mixed with butter milk or sour skimmed milk.		Meat or Blood Meal	10 lbs.
		Mixed with lukewarm water.	

These rations, with a little salt, should be mixed to the consistency of porridge and fed in suitable troughs, sufficient in quantity for the birds to consume readily at each meal. Fresh clean water should be accessible at all times and green food supplied daily. It is necessary to supply grit three times weekly when part of the ration is composed of grain. Grain should not be supplied to crate fed birds. Unless the food is palatable, the birds will not consume sufficient for the best gain in weight. Salt increases the palatability and the foods must be of good quality. If milk or butter milk cannot be supplied in sufficient quantities, animal food of some kind must be supplied. To advance the process of digestion the mash should be half sour, this is obtained by mixing the food with sour milk

or butter milk or mixing the food in advance of each meal to allow it to become slightly acid.

Crate for Dispatching Birds.—The coops for sending live poultry to market should be 3 feet long, 2 feet wide and 13 inches high. A coop of these dimensions will accommodate 10 to 12 adult fowls or ducks and 15 to 18 chickens, depending upon their size. For 6 turkeys a coop 20 inches high is required. The coop should be as light as possible consistent with durability to save freightage. The frames can be made of sound wood (1 x $2\frac{1}{2}$ inches), whilst the tops and sides should be covered with 1-inch wire netting to provide plenty of ventilation. The bottom of the coop should be solid, consisting of planks $\frac{1}{2}$ inch thick nailed closely together to prevent injury to the feet of the birds.

Caponising.—By caponising is meant the removal of the generative organs of the male chicken, thereby destroying his power to breed. The de-sexed cockerel is thus termed a "capon." He becomes very docile, slow of movement and loses all inclination for fighting, and is content to keep his own company. His spurs keep growing, but the comb and wattles diminish rather than increase in size. They also lose their bright red colour. The flesh of a capon remains tender; he fattens readily and produces a plump, juicy, fine-grained flesh. If given sufficient time, he grows to a much larger size than would be the case if not caponised. Capons readily adapt themselves to close confinement and seem to devote their energy almost entirely to eating and growing. The desirable qualities of quick growth and ready fattening which the capon possesses are particularly favourable to the production of plump, profitable table birds.

A set of modern instruments for performing the operation should be obtained. A dish containing antiseptic solution, which should be used cold, and two cords 3 feet in length, a sponge or a piece of absorbent material such as cotton wool, with a needle and cotton completes the requirements. Whatever the season of the year, the cockerels to be operated upon should be young, usually from 8 to 12 weeks old or weighing from $1\frac{1}{2}$ to 2 lbs. The age for caponising will, therefore, depend upon the breed, as some mature earlier than do others.

A good indication that they are in fit condition also is immediately they commence to crow. There are certain precautions necessary before the operation is commenced, small details they may seem, but if neglected will cause the most serious results. The birds to be caponised should be kept in a clean coop and should be starved for 24 to 36 hours. Water may be withheld two hours before the operation in order thoroughly to empty the system of all food, as it is almost impossible to caponise with ease and successfully if the intestines contain food. The instruments should be perfectly clean and when not in use should be placed in the dish containing disinfectant during the operation. It is necessary to emphasise that cleanliness is important and the operation should be done quickly but carefully.

The best plan to follow is to experiment with one or two dead fowls. In this way there will be less danger of causing unnecessary delay when the operation is attempted for the first time with live birds. A little confidence and a bright sunny day are required to perform the operation satisfactorily.

The mode of procedure is as follows:—

Take a piece of stout cord about 3 feet in length with a running noose at each end. One noose is fastened above the hocks of the bird and in the other loop a stone or suitable weight is fastened heavy enough to hold the bird. The other cord is tied around the wings close to the body of the bird, and to the other end of this a weight is attached. The bird is then laid upon its side on a table or box of convenient height for the operator, and the two weights allowed to hand over the opposite sides of the table, thus holding the bird stretched out in proper position.

A few feathers should be removed from the uppermost side of the body in front of the thigh, and the feathers around this area damped in order to keep them lying close to the body. The bare patch should be bathed with the antiseptic and water solution, which has the effect of cleaning and numbing the skin. The skin should be elevated by gripping it with thumb and fore-finger and an incision about 1¼ inches is made in the skin just above the first two ribs next to the thigh. Then carefully locate the space

between these ribs, at this stage care should be exercised in regard to the thigh muscle, which in the case of some birds covers the first two ribs. This muscle should be held on one side before any further incisions are made, for if it is lanced it will not only cripple the bird, but will cause excessive bleeding and thus delay the operation. The tissue between the ribs should be penetrated with the lancet about ¾ inch from the backbone, this incision should be large enough to place the spreaders in position, thus keeping the ribs apart, while it is extended 1 to 1½ inches in length.

It is important in extending the incision to cut towards the breast bone, not towards the spine, in order to minimise any risk of cutting the kidneys, which would be fatal. Within the body cavity a thin transparent membrane will be observed, this is the lining of the abdominal cavity and should be carefully pricked open, when the interior of the abdomen will become visible. The organ to be removed is light in colour and the shape of a bean and is attached close to the backbone. The usual course is to insert the extractor, pass it around the organ, and take a firm hold of the ligament and artery by which the organ is attached. When this is done the organ is detached by carefully twisting the extractor and at the same time gradually withdrawing the instrument containing the organ. If the detached organ falls into the abdomen it should be recovered with the extractor, otherwise serious complications will arise. It is then necessary to stitch the skin with needle and cotton, carefully drawing the cut surfaces together and tying them firmly. Although it is customary to remove the organs separately by turning the bird over and repeating this operation on the other side, it is possible to remove both the organs through the one incision. This, however, requires considerable experience, as it is accompanied by greater risk of fatal injury and is not as easy or expeditious as operating on both sides. When both organs are to be operated upon through the same incision, the lower one should first be removed.

After completing the operation the birds should be placed in suitable quarters without perches, but well littered with clean hay, and a good plan is to give them water and a feed of soft food immediately. The wound soon heals and the birds may be given their usual rations after two or three

days. It is not unusual for some birds after the operation to develop air puffs or inflation, which is an accumulation of air under the skin. This condition can be relieved by opening the skin with a needle or the point of a knife and pressing out the air.

Capons may be fed on the usual chick rearing rations. A grain ration should be given in addition to mash. Capons should be colonised or kept on free range to make the most economical gains during their long growing period. They should be fattened for two or three weeks before they are marketed, by increasing the maize meal and maize in the ration either whilst on range or when confined in pens.

Light portable grass shelters such as are used for colonising growing pullets make very desirable quarters for growing capons.

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GWELO MUNICIPAL DEMONSTRATION STATION.

ANNUAL REPORT FOR YEAR 1931-32.

By D. E. McLoughlin, Assistant Agriculturist.

The season under review was not a favourable one for crop production although the total precipitation amounted to 25.35 inches at the Sand Veld Station and 25.64 inches at the Gaol, situated in the township.

The following table gives the distribution of the rainfall for the season and the average for previous years:—

Month.	Rainfall 1931-32.	Total No. of rain days.	Greatest amount in one day.	Average for 30 years to 1929-30.
July	0.10	1	0.10	0.02
August	—	—	—	0.08
September	—	—	—	0.17
October	0.36	2	0.19	0.74
November	5.15	12	1.35	3.66
December	1.34	5	0.48	6.00
January	4.99	16	1.07	5.98
February	2.39	9	1.20	5.33
March	10.07	13	2.17	3.34
April	1.14	8	0.49	0.71
May	0.10	1	0.10	0.32
June	—	—	—	0.02
Total	25.64	67	2.17	26.37

Gwelo Experiment Station (Sand Veld).

Month.	Rainfall 1931-32.	Total No. of rain days.	Greatest amount in one day.
July	0.02	1	0.02
August	—	—	—
September	—	—	—
October	0.25	2	0.15
November	5.69	9	1.40
December	1.58	5	0.85
January	6.05	13	1.04
February	3.22	12	1.51
March	7.28	15	1.70
April	1.25	8	0.50
May	—	—	—
June	—	—	—
Total	25.35	65	1.70

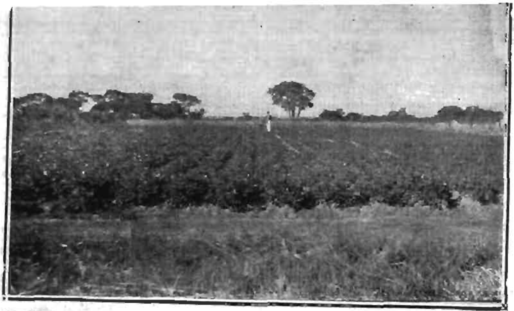
At first glance a total fall of 25.35 inches would appear to be a satisfactory one, but when analysed the distribution is found to be very unfavourable. Mr. Hopkins, who is in charge of the two stations, reports as follows:—"There were several prolonged droughts, each sufficiently long in duration to be distinctly harmful in its effects; these periods were from the 17th November to the 1st December, 4th to 19th December, 23rd December to 13th January, 31st January to 16th February and from the 17th March to the 15th April. During the months November to April, there were in all 20 days without rain in November, 26 days in December, 18 days in January, 17 days in February, 16 days in March and 22 days in April. The absence of rain, combined with high temperatures during the early period of growth and at other critical stages was responsible for the reduced yields recorded. Particularly do these remarks apply to the red soil station where conditions were less favourable, and although there is no rain gauge there, I am able to state definitely from careful observations that many showers recorded at the sand veld station and nearby did not extend to the red soil station.

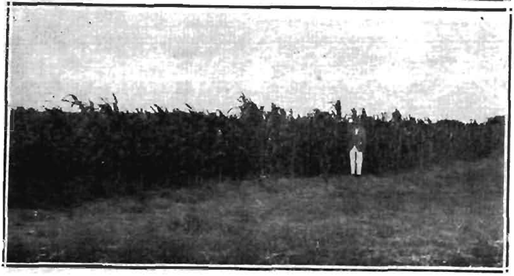
RED SOIL STATION, GWELO.

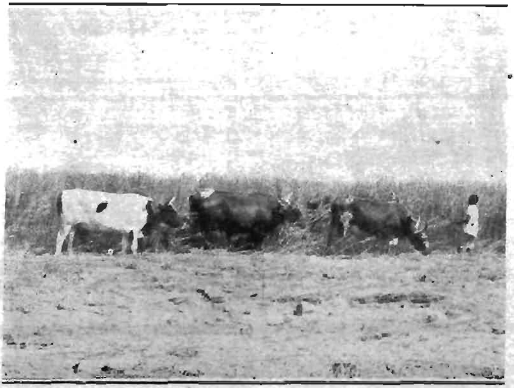
Fig. 1. Plot No. 7. In foreground, velvet beans to be reaped (after oats). In background, maize plot No. 6 plus 200 lbs. superphosphate per acre (after velvet beans reaped).

Fig. 2. Plot No. 9. Maize plus 8 tons kraal manure per acre (after maize).

Fig. 3. Plot No. 14. Ground nuts plus 200 lbs. superphosphate per acre (after maize).







SAND VELD AREA.

Fig. 4. Plot No. 7B. Ground nuts (after oats plus kraal manure).
Fig. 5. Plot No. 8A. Maize and velvet beans plus 6 to 7 tons kraal manure per acre.
Fig. 6. Sunn hemp crop being ploughed under.

"The early rains enabled a good seed bed to be prepared and an excellent germination followed. Sowing was commenced on the 8th November and the maize plots were completed by the 13th November, up to which date the precipitation registered at the sand veld station was 4.12 inches.

"The application of Derisol for the control of maize stalk-borer, in the early stage of growth, proved very efficient and practically no reduction in yield can be attributed to this pest. On the red soil station the maize ears were considerably smaller and the grain lighter than on the sand veld section."

Red Soil Area.—The total yield of maize from 5¾ acres was 9,304 lbs. of grain, or approximately 8 bags per acre, as against a yield of 10 bags an acre from 6 acres on the sand veld station.

Yields here of ground nuts, too, compared with previous seasons are such as almost to be regarded as failures, the best yield being only 5.6 bags as against the excellent return of 26.55 bags per acre on the sand veld section. The quality on both stations did not reach the standard of previous years, the kernels not being as plump. The following crops failed on account of drought: Summer wheat, Hull-less, Kherson and S.E.S. oats.

Rotation Experiments.—Two four course rotations are in progress, the land in each during the four years growing two crops of maize, one of ground nuts and one of sunn hemp (Series "A") and two crops of maize, one of dolichos beans and one of oats (Series "B").

In Series "A" no animal manure is used, but a green manure crop is ploughed under every fourth year, and the following maize crop receives artificial fertiliser. In 1923-24 and 1924-25 the maize after green manure received 150 lbs. complete maize fertiliser per acre and from 1925-26 to 1930-31, 200 lbs. of bone and superphosphate, since when the dressing has been amended to 250 lbs. raw rock phosphate per acre.

Commencing 1931-32 the second maize crop in this series receives 200 lbs. bone and superphosphate per acre and no fertiliser is applied to the ground nut crop, which in past years received direct 200 lbs. superphosphate per acre.

In Series "B" 7 to 8 tons of kraal manure per acre are applied to the maize every fourth year, while the legume crop—dolichos beans—is reaped for grain or fodder and the residue only is ploughed in. Thus in these two systems the necessary supplies of organic matter are provided by kraal manure and green manuring respectively, and the relative values of the two are compared.

The maize continuous plot provides a check on the above rotations. On the one half of the plot maize has been grown year after year without any treatment and on the other half of the plot the maize receives 150 lbs. bone and superphosphate every alternate year, but no organic matter has been applied either by means of green manuring or farm manure.

RED SOIL STATION: ROTATION EXPERIMENTS, SERIES "A."

Plots of ½ acre each.

Yields of maize in bags of 200 lbs. each per acre.

Yield of ground nuts in bags of 75 lbs. each per acre.

Crop.	1928-29 to 1931-32 Av. yield for 2nd period. Av. annual rainfall 26.4 inches.	1924-25 to 1927-28 Av. yield for 1st period. Av. annual rainfall 26.41 inches.	Av. yield per acre for 8 years.
Velvet beans / *Sunn hemp } Ploughed under	—	—	—
*Maize: received 200 lbs. per acre bone and superphosphate after green manure ploughed under, up to season 1930-31	12.70	14.44	13.57
*Maize: without fertiliser, after maize receiving fertiliser up to season 1930-31	11.11	11.25	11.17
*Ground nuts: received 200 lbs. per acre superphosphate after maize receiving no fertiliser, up to season 1930-31	14.60	18.40 (3 years)	16.50

* *Commencing 1930-31, Sunn hemp replaced velvet beans as a green manure crop. From 1931-32, the maize following Sunn hemp ploughed under received 250 lbs. raw rock phosphate per acre, and the maize previously unfertilised 200 lbs. bone and superphosphate per acre. From same date ground nuts receive no fertiliser.*

SERIES "B."

Yield of velvet beans and dolichos beans in bags of 200 lbs. per acre.

Crop.	1928-29 to 1931-32 Av. yield for 2nd period. Av. annual rainfall 26.4 inches.	1924-25 to 1927-28 Av. yield for 1st period. Av. annual rainfall 26.41 inches.	Av. yield per acre for 8 years.
Velvet beans, reaped	—	3.14	—
†Dolichos beans, reaped	5.17	—	—
Maize: receives 200 lbs. superphosphates per acre; after beans reaped	12.29	9.60	10.95
Maize: receives 7-8 tons farm manure per acre; after maize plus fertiliser	13.45	15.10	14.26
Oats (Kherson): after maize plus farm manure	900 lbs. (1 year)	604 lbs. (1 year)	752 lbs. (2 years)
MAIZE CONTINUOUS.			
‡"A" Maize continuous without treatment	7.01	5.85	6.43
"B" Maize continuous: receives 150 lbs. per acre bone and superphosphate every third year (fertilised 1930-31)	9.60	9.40	9.5

† *Commencing* 1930-31, *dolichos beans replaced velvet beans.*

‡ *In* 1927-28, *fertiliser was by error applied to Plot "A" instead of Plot "B."*

The average yields given above are for the four years in each period and for the eight successive years in which crops were reaped for grain. In the first year, 1923-4, owing to rawness of land, late ploughing and planting and drought all crops on the station were poor and maize was reaped for silage.

These rotation experiments demonstrate that by a well balanced system of cropping which provides for an adequate supply of humus in the soil, combined with dressings of phosphate fertiliser once or twice in the four-year period, the fertility of the land can be increased and heavier yields secured, particularly in seasons experiencing droughty conditions. Convincing evidence of the beneficial effects of green manuring is provided by the results following a legume

ploughed under combined with two dressings of phosphatic fertiliser, compared with an application of 7 to 8 tons of kraal manure and one dressing of phosphatic fertiliser. In the unfavourable season under review, the maize plus raw rock phosphate following a green manure, exceeded the yield of the maize plus kraal manure by two bags per acre, and in six years out of eight, when the precipitation failed to exceed 23.5 inches, by an average of a quarter of a bag per acre. In two seasons out of the eight, when the precipitation exceeded 23.5 inches, namely, in 1924-25 with 47.21 inches and 1928-29 with 34.07 inches, there was a difference of 3.5 bags an acre in favour of the kraal manure.

Legumes and Green Manure Crops.—The suitability of a legume possessing an upright growth and which will permit of harvesting by machinery is of considerable importance, since the trailing legumes at present grown, namely, velvet beans, dolichos beans and cowpeas or kaffir beans must be harvested by tedious hand methods. The suitability of the soya bean as a rotation crop with maize and as a grain and fodder crop is receiving much attention at the Salisbury Experiment Station, and trials have been in progress for three seasons at the Gwelo station to test the merits of this crop under the conditions of soil and climate pertaining to the Midlands. Experience has shown that except on soils heavily manured or containing much organic matter, the crop is not likely to succeed without inoculation being effected, either by means of approved commercial cultures of soya bean bacteria or possibly by soil previously inoculated. The requisite bacteria for the inoculation of the soya bean plant do not appear to occur naturally in any Rhodesian soils, and points which require further study are the length of time bacteria introduced by inoculation of the crop can remain alive in the soil and the frequency within a rotation with which soya beans must be grown to enable the bacteria to survive from one planting of the crop to the next.

The season under review was not a favourable one for soya beans although the yields of grain are slightly in excess of those obtained the previous year. Growth was not so vigorous, but the reaping of the grain was better understood

and more satisfactorily carried out. The formation of root nodules in the inoculated plots was observed, and disclosed the fact that more nodules were formed towards the latter end of March than in the early part of the growing season (January-February).

Both in 1930-31 and 1931-32 the yields of grain from the inoculated plots exceeded that of the uninoculated plots, and similar results were obtained in the second year, on plots inoculated in 1930-31.

SOYA BEANS.

Yields in lbs. per acre.

	Season 1930-31. Rainfall, 21.88 ins.	Season 1931-32. Rainfall, 25.59 ins.	Average yield per acre (2 years)
Inoculated	700	700	700
Not inoculated	488	596	542
After soya beans inoculated 1930-31	—	780	—
After soya beans not inoculated 1930-31	—	560	—

Dolichos and Velvet Beans.—Better average yields of grain have been obtained with the small brown seeded dolichos than with any variety of velvet bean or cowpea on account of its ability to thrive under extreme climatic conditions. In the rotation experiment, the qualities of the dolichos bean are again admirably demonstrated, with a return of 1,200 lbs. of grain per acre. In addition to providing heavy yields of grain, this bean is advocated as a valuable soil improving crop, being generally suitable for either grain, hay, silage, or green manuring. Its hay is less fibrous and more palatable and its yields greater than that of the velvet bean. The dolichos bean is of the utmost value to the "mixed" farmer though on purely maize and grain farms it has been almost wholly superseded by Sunn hemp, on account of the latter's merits as a combined weed-smother and green manure crop.

The opportunity may be taken here of referring to the question of witch weed and its prevalence in parts of the

Midlands. That the parasite should appear particularly prevalent on farms where green manuring has been combined with the regular use of artificial fertilisers is not as illogical as it might at first glance appear. The farmer's lack of attention to witch weed and its control has permitted the invasion of the weed and allowed of its spread until the land has become densely infested with seed. High soil fertility then further encourages the growth of witch weed owing to the more vigorous growth of the root system of the maize. It has been suggested that a wise policy would be to refrain from fertilising and green manuring, but this is far from being wise, since in the absence of both treatments the maize would fail entirely from combined lack of fertility and attack of the weed.

In the case of heavy infestations of witch weed the maize grower can at one and the same time increase the fertility of the soil and eradicate the weed. This may be done by substituting trap-cropping for green manuring, using for the former purpose either Sudan grass or certain varieties of kaffir corn. Results obtained at the Salisbury Experiment Station indicate that the ploughing under of two crops of kaffir corn in one season, each of about eight weeks' growth, is about as efficacious in adding organic matter to the soil as one legume crop ploughed under.

Sand Veld Station.—The season under review was a favourable one for this station. The land here, though admittedly very low in fertility, suffers more on account of bad drainage than from actual poverty, and crop yields are reduced more heavily by an unusually wet season than are those on the red soil area. On many of the plots there are depressions of considerable size, while on others the soil is shallow and stony. The land as a whole is considerably inferior to the average soils brought under cultivation on most granite farms, and in consequence considerably higher average yields should be obtained elsewhere with the same cultural treatment than those recorded here. The inadequate depth of surface soil adversely affects crops in seasons of either low or excessive rainfall.

The normal treatment accorded to ordinary soils failed here to maintain the land in good fertility and in consequence

applications of kraal manure at the rate of six tons per acre were applied as follows to plots in rotation A. In the season 1926-27 to all the plots, in 1927-28 to half the acreage, in 1928-29 to a quarter of the land, and in 1929-30 to all of the plots.

In rotation B only one quarter of the acreage received six tons of kraal manure per acre in the seasons 1926-27, 1927-28 and 1929-30, but in 1928-29 all the plots received this treatment.

With a view to further augmenting the organic matter supplies, the maize was annually undersown to various legumes intended to be ploughed under after the main crop was stooked.

Prior to 1929 legumes, including soya beans, dhal, wedge pea, gram, velvet beans, Jack beans and cowpeas, were tested for undersowing. The only one, however, which proved satisfactory was the cowpea or kaffir bean, and most of the plots thus did not benefit to any extent by this undersowing owing to failure of the legumes. In some seasons conspicuous by absence of late rains, the cowpea undersowings also failed. Although in certain favourable seasons satisfactory returns of maize have been obtained from this land, it cannot be claimed that on the average crops have responded to the treatment in the manner anticipated. The reasons for this lack of response have already been explained.

Owing to the poor yields it had recently given, the whole of the sand veld area in 1930-31, excepting plot No. 5, was green manured with Sunn hemp fertilised with 200 lbs. raw rock phosphate per acre, the green manure being ploughed under in March, 1931. The growth was so heavy and the ground so hard, owing to lack of rain in February and March that year, that the greatest difficulty was experienced in turning the crop under.

It is of considerable interest, however, to note the surprisingly good yields produced by this poor soil after the green manuring, and the following remarks by Mr. Hopkins

on the moisture content of the soil when ploughing the land the following winter are also deserving attention:—

"One obvious result of the green manuring with Sunn hemp last season is the increased moisture content of the soil, which factor is most noticeable at the present time (July, 1932) during ploughing operations. The maize cobs, too, were considerably larger, better developed and much more uniform in size than those produced in any previous season. *Here also derrisol applied in the early stages of* growth had remarkable results against maize stalk-borer."

It will be enlightening to observe the subsequent yields which may be produced after this green manuring and the number of successful crops that can be grown before again having to resort to green manuring.

The total yield of maize from six acres was 11,888 lbs. of grain, or 10 bags per acre, as against 8 bags per acre *on the red soil area. The highest yields were obtained in* the rotation plots, series A, plus kraal manure—16 bags per acre; and in series B, also with kraal manure—15 bags per acre.

ROTATIONS.

In both the four-course rotations followed, half the land each year is under maize, a quarter under ground nuts and a quarter under oats. In series A the lands receives 200 lbs. per acre of bone and superphosphate and six tons kraal manure per acre every four years, the former being applied to the maize following the ground nut crop which receives the kraal manure. Commencing 1931-32, the manure is applied to the maize crop following ground nuts and the fertiliser to the second maize crop.

In series B the cropping is a duplicate of that in series A. A fertiliser dressing of 200 lbs. per acre of superphosphate is applied to the ground nut crop, and the maize receives the kraal manure. Commencing in 1929-30, the one maize crop in each series is underplanted at the last cultivation in January to cowpeas. From 1932-33 a legume will replace oats in both series, and whenever considered necessary will be ploughed under as a green manure.

ROTATION SERIES "A."

Yield in Bags per Acre.

Crop.	1931-32 25.59 inches.	1929-30 23.39 inches.	1928-29 33.54 inches.	1927-28 19.64 inches.	1926-27 19 inches.	Average yield.
Maize: up to 1929-30 received 200 lbs. bone and superphosphate per acre following ground nuts	15.92	3.6 KM	4.6	6.5	15.0 KM	9.12
Maize: no treatment, following maize receiving fertiliser ...	13.13	4.0 KM	5.1	5.6 KM	11.0 KM	7.77
Oats: following maize ..	Failure	312 lbs. KM	580 lbs.	failed	failed	446 lbs.
Ground nuts: Up to 1929-30 received 6 tons kraal manure per acre following oats	26.55	10.5 KM	7.0 KM	10.8 KM	20.0 KM	14.97

KM = Kraal manure applied at the rate of 6 tons per acre.

In 1926-27 all plots received a dressing of six tons per acre of kraal manure. In 1927-28 the maize after maize plus fertiliser received six tons of kraal manure per acre, and in 1929-30 all plots again received six tons of kraal manure per acre. In 1930-31 all plots were green manured with Sunu hemp, which received 200 lbs. raw rock phosphate per acre.

It will be observed that in three seasons out of five the oat crop has failed entirely, and it is now concluded that the rainfall of the Midlands is too unreliable to warrant the growing of oats as a rainy season crop on upland soils.

ROTATION SERIES "B."

Yield in Bags per Acre.

Crop.	1931-32	1929-30	1928-29	1927-28	1926-27	Average Yield.
Maize: no treatment, following ground nuts plus fertiliser	11.51	6.3	3.8 KM	3.2	10.5	7.06
Maize: receives 6 tons kraal manure per acre, following maize without treatment ...	14.39	4.0 KM	4.8 KM	6.9 KM	13.5 KM	8.72
Oats (Kinvarra): No treatment, following maize receiving kraal manure	failed	—	372 lbs. KM	failed	failed	372 lbs. (1 season)
Ground nuts: receive 200 lbs. per acre of superphosphate	15.2	15.2	7.6 KM	9.3	16.0	12.7

KM = Kraal manure applied at the rate of 6 tons per acre.

In 1930-31 all plots were green manured with Sunn hemp, which received 200 lbs. raw rock phosphate per acre. In 1931-32 no fertiliser was applied to the ground nut crop.

In this rotation the oat crop has failed entirely in three years out of five.

Ground Nuts.—The highest yields of this crop on the sand veld station were 27 bags per acre in 1928-29 and 26.5 bags in 1931-32. On the red soil station the highest yield has been 23 bags per acre. The average yield per acre for Spanish bunch variety over the seven-year period for all plots on the station, including rotation plots which invariably give good returns, is 13.5 bags per acre. Virginia bunch out-yielded Spanish bunch on both stations when planted three weeks earlier than the Spanish bunch. The difference between the average yield of all plots was 6 bags an acre in favour of Virginia bunch.

This variety is slower to mature and should be planted two to three weeks earlier than the Spanish bunch.

From the above returns it will be seen that ground nuts are one of the most dependable and profitable crops to grow on poor sandy soils such as exist on this station. But it should be emphasised that the crop requires a well drained soil and that the best results are obtained when it is grown in a suitable rotation on land well supplied with organic matter.

Apart from tobacco, the ground nut should prove one of the most profitable crops that can be grown on the upland sandy soils. It can be grown economically on this class of land for the following reasons: Good stands can be obtained with a maize planter fitted with a ground nut planting attachment, the additional cost of which with one machine is only 20s.; the friable nature of the soil permits of the better development of the nut and under such conditions larger yields and a higher percentage of large exportable nuts are obtained; the lifting of the crop by "pulling clean" can usually be practised, thus reducing labour in harvesting; the colour of the shells of sand veld nuts appears more acceptable on the overseas market for the "barrow" trade, and the further treatment of scouring or bleaching of the shells, less laborious and costly.

The crop is one pre-eminently suited to sand veld soils and the results on this station during the past seven years provide a plain demonstration of the fact that ground nuts may well become an important product of Midland farms. The average yield of Virginia bunch nuts from acre plots on the sand veld station in 1931-32 was 20.12 bags and of Spanish bunch 14.35 bags, while of the latter variety the average yield of all plots, well and indifferently treated, over the past seven years, has been 13.5 bags an acre.

THE GROWING AND HANDLING OF GROUND NUTS FOR EXPORT OVERSEAS.

Contributed by a Ground Nut Grower of considerable Experience.

The following article by one who has for several years exported unshelled ground nuts to England for the confectionery and street barrow trade, is published in the confident belief that it will prove of the utmost value to many growers of this product. We trust that the information provided will assist in placing the industry on a sounder basis and will help towards securing a permanent outlet overseas for a crop which the Colony might produce in very large quantities.

Visitors to the Department of Agriculture's exhibits at the last Salisbury Show may recall having seen a sample of "washed nuts" grown on heavy red soil and also an exhibit of clean white nuts grown by a farmer on sand veld. Both exhibits bore excellent testimony to the efficacy of scouring nuts in sharp sand and water.—Division of Plant Industry.

The successful export to overseas markets of ground nuts in shell depends from a financial point of view mainly on two factors: (1) the state of the market on arrival of the

consignment, (2) the quality of the nuts and the appearance of the shell. The nuts should usually contain 3 to 4 kernels in each shell.

The market for this commodity in my experience is a fluctuating one. I exported through the Farmers' Co-op., Ltd., Salisbury, for two seasons, namely, in 1930 and 1931. The first year I struck a good demand for nuts in the shell and realised a good price, I think it worked out at 17s. per 112 lbs. nett on rail. In 1931, although my nuts were very carefully selected and in my opinion were good, I did not happen to strike a good market, and the two consignments of 11 tons realised 9s. 9d. nett Salisbury, based on an average overseas price of 23s. per cwt. (£23 per ton). This year I learn prices have been very much higher.

Seed Selection.—I have been selecting my seed very carefully for the last four years, and aim at planting nearly all 4-kernel nuts. I firmly believe that 70 to 80 per cent. of my nuts now contain 3 and 4 kernels. Last season I tested a small plot of 5-kernel nuts. These I planted by hand in rows 2ft. 6in. apart and 12in. between plants in a plot half an acre in extent. I actually reaped 30½ bags of nuts from this half acre, which is equivalent to 61 bags per acre. The nuts were good and extra long and 60 per cent. of them contained four kernels in the shell; a small percentage contained 5 kernels. By planting all the 5-kernel nuts again I hope to increase the percentage of these. Last year I found three nuts containing six kernels.

Planting Distance and Cultivation.—For the production of export nuts in shell I do not agree with the closer spacings usually recommended for commercial nuts. I find that wider spacings give one a much larger percentage of exportable nuts and that with a spacing closer than 2ft. 6in. between the rows the nuts are disturbed and become deformed and simply cannot be compared with those produced from plants with plenty of room to expand between the rows. The advantages of spacing the rows 2ft. 6in. apart and 6in. between plants are (a) one can get the rows fairly straight when using a planter fitted with a ground nut attachment, whereas when splitting the rows it is more difficult to space the drills at a uniform width, (b) the rows are conveniently

wide to permit of cultivation by oxen and implements without damaging the plants and nuts in their various stages of development.

I am most careful to cultivate only when the soil is in a fit condition, and never cultivate the nuts by hand. My crop is cultivated three times with an ordinary 5-tooth cultivator; with the last two cultivations the wings are attached to throw the earth against the plants in ridges.

With the exception of special seed grown under test, I always plant by machine, using a maize planter fitted with special plates, and obtain very good stands in the field. Planting receives every consideration with me, as I aim at a perfect stand. I experience very little trouble in the splitting of the kernels when planting by machine. Much of the trouble with split kernels is due to the seed being too dry at the time of planting. I find that by placing damp sacks over the kernels overnight they absorb moisture, which prevents them from splitting.

When shelling the nuts by machine, the same principle applies.

Soils.—Even at this stage of farming in Rhodesia a great many farmers to-day do not appear to know suitable ground nut soil when they see it. Only recently a fellow farmer who visited me astounded me by saying he had no suitable soil for ground nuts on his farm. I had been on his place on many occasions and once made a report on his farm, and believe me he has the finest soil for ground nut cultivation in Rhodesia.

On my own farm I have two classes of soil, both red. The land in the heavy clearing gives the heavier yield, but the nuts are not so clean. On slightly lighter soil found on the edges of the heavy timbered land the nuts "pull" quite clean, although this soil is also red. On 50 acres of this latter class of soil, ploughed last dry season, with the soil turning up rough and the grass and roots not properly rotted, I obtained 15 bags of nuts per acre without any fertiliser, and when spacing the rows 2ft. 6in. apart.

Reaping and Shelling.—My ground nut operations are mostly based on contract work. My natives "pull" 2,400

yards each per diem, and on this job they are *not on task* as it has to be done carefully and cannot be hurried. Twenty natives gather and place into "cocks" 50 acres in one and a half days. All natives pick two bags of nuts from the vines per diem on contract, and carry the bags to the shed. In selecting and sorting the nuts, each native does two bags a day. On many of these tasks some natives finished up by 1 p.m. and not one later than 4 p.m.; they got to like their tasks and I never attempted to increase their amount of work.

Shelling.—Two natives with my hand-sheller turn out 20 bags per diem. After I have shelled about 100 bags I put the kernels through a winnower and then one native grades one bag per diem. The shelling and grading I find to be a simple matter. The job is performed by a series of sieves which turn out a good sample. If only the shelled kernels could be marketed profitably it would solve many difficulties and reduce the export costs in certain directions; although, however, the treating of the shells is now quite a simple and easy process with the water and sand method of washing.

Date of Planting.—The Spanish Bunch variety in my district I consider should be planted normally during the first week in December, as this enables one to "pull" the plants before the ground dries too hard. With late plantings I estimate that from 5 to 10 per cent. of the nuts are left behind in the ground and generally these represent the best nuts; hoeing these out by hand or with scrapers is a very tedious job, and using the badzer a large percentage are generally damaged.

Cleaning Ground Nuts with Sand and Water.—I read with great interest of the process of bleaching nuts with a solution of sodium bisulphide (described in the April, 1932, issue of the *Rhodesia Agricultural Journal*), and, as this year my nuts were discoloured owing to the late rains in April, I undertook and perfected a very simple and inexpensive method of removing the dry particles of soil adhering to the shells as well as of bleaching them beyond recognition.

The following is the method of washing in sharp sand and water which gave me such remarkable results. I used

a 44-gallon petrol drum fitted with two windlass handles fixed by flanges to the centre on either side of the drum, the windlass and drum being mounted on two poles let 24in. into the ground, with a pole across the top. A lid on top of the drum was made fairly large (it should be made as large as possible).

The drum works end over end like a churn and the sand falls from top to bottom every half turn. The drum is charged with a full petrol-tin of sharp river sand and three petrol tins of water. Half a bag of nuts is emptied into this charge and turned one hundred times in 1½ minutes approximately.

The nuts, which float, are scooped out into a hand sieve and the contents and sieve are then immersed a few times in clean water. After washing in water the nuts are emptied out on to frames of ½in. mesh netting which should be at least 12in. from the ground to allow a good circulation of air underneath to dry them out. The nuts are left to dry in the open, exposed to the sun, for 24 hours. One roll of netting provides four frames, each 12½ yards long.

For washing the nuts in clean water after they are taken from the drum, I used half a 400-gallon galvanised iron tank and made the sieves to fit comfortably inside this. Two natives hold the sieve and work it up and down in the water two or three times.

The water in the drum requires to be changed with every five bags of nuts washed, or with less, depending on the amount of soil adhering to the nuts, and the water in the tank should be changed when it becomes obviously discoloured.. The water from the tank is again used in the drum with sand for the next lot of nuts to be treated.

Three natives treated 20 bags daily, but I am quite sure with, say, six natives—allocated as follows—one could treat 30 to 40 bags daily: two natives to the drum, two to the sieve and two carting water, bagging, weighing and sewing the bags.

The product of a farmer in my district who used my drum was perfect, and in all my experience I have not seen cleaner nuts.

ASPARAGUS STORAGE.

GERMAN EXPERIMENTS.

An interesting and instructive report on German experiments in packing and storing fresh asparagus has recently been drawn up by an American Trade Commissioner in Berlin and published in the official journal of the U.S.A. Bureau of Foreign and Domestic Commerce, Washington. It is emphasised that asparagus is a highly perishable vegetable, and that the season for its consumption in the fresh state is very short—from six to eight weeks. Prices are naturally highest at the beginning of the season, and drop as arrivals increase towards the high point of the season.

The experiments relating to the keeping of asparagus in cold storage have been made with the object of lengthening the season during which fresh asparagus is available and maintaining prices at more or less stable levels. The temperature of the cold storage chambers, states the report, was held at from 32 degrees F. to 33.8 degrees F. with a relative humidity of 90 per cent. Under 32 degrees F. it was found that considerable damage was caused by frost and that each degree over 32 degrees F. increased materially the chances for mould to develop because the relative humidity had to be kept at such a high point. Therefore, the most important experiments were carried on with a temperature from 32 degrees F. to 33.8 degrees F. all with a relative humidity of 90 per cent.

In order to minimise the damage of mould, it was necessary to pre-cool the fresh asparagus very quickly after it was cut and eliminate as much as possible all transportation, cutting and packing. The asparagus must be placed in storage not later than 24 hours after it is cut, and it must be sound and without bruises. Before the rooms are filled with asparagus they are thoroughly disinfected by shooting

oxone through them. The packing material also must be as sterile as possible in order to keep bacteria growth at a minimum. The experiments showed that, generally, asparagus having a blue shimmer to the tip and shot a trifle more than the average softened much quicker in storage than the heads which were absolutely white and were dug underground.

The asparagus stalks were packed in various ways, namely, loose in sand, in peach mulch, in oil paper, and in glassine paper, as well as in parchment paper and in cork dust. The bundles were wrapped in half-kilos and one-kilo packages. Asparagus packed in weather-proof glassine paper showed the best results. Oil paper gave the next best results, but did not compare with glassine paper in that the vegetable did not keep so well and could not be seen while in storage. All other methods of packing proved of no value.

The general results of the experiments are summarised in the report as follows: The fresh asparagus of good quality packed in glassine paper and stored in a chamber with a 90 per cent. moisture content and a temperature from 32 degrees to 33.8 degrees F. kept very well from five to seven weeks. After this, individual heads began to get soft and it was firmly established that the maximum time the vegetables could be kept in storage is eight weeks. There was no difference between the asparagus that was washed before being placed in storage and that which was unwashed.

Experiments made in cooking showed that there was absolutely no difference in the taste of the vegetable after its six to eight weeks' storage. The report concludes by pointing out that the storage costs incurred were well worth while, because of the higher prices obtained for stored asparagus after the height of the season was passed. ("Ice and Cold Storage," October, 1932.)

FARMING CALENDAR.

December.

BEE-KEEPING.

With a normal season the first or main honey-flow of the year should now be over and the honey ready to be robbed. Before doing this, see that all or the main portion of the frames are capped and sealed, otherwise there will be trouble later on by fermentation. There is nothing on the market to equal the Porter bee-escape board to clear out the bees from the crate, but be sure and see that the board in question is placed the right side up under the crate; failure to do this (and in the hurry of the minute it can easily be so done) will result in the probable suffocation of the bees and the loss of the honey, to say nothing of the chances of robbing from any close-by hives. Replace the empty combs and frames as soon as possible on the hives, to be cleaned up and mended where necessary, and for future storage of more honey. During the very hot spells watch the hives and provide extra ventilation, by inserting small metal wedges between the crates, just wide enough to allow air in, but not a bee under any consideration. Keep all water tins under the hive-stand legs full of water, and see that water is available for the worker bee, which drinks a good deal. When extracting honey, do so in a bee-tight room or verandah, otherwise the operator may have a lot of trouble from other colonies, which quickly find where honey is. Always have one or more crates of shallow frames ready with foundation fixed to place on hives as the season may warrant; such will mean always something for the bees to work at, and during the last flow they may be invaluable to store any such catch crop of nectar, as from tobacco, etc., when the natural flora is finished.

CITRUS FRUITS.

This is a good month to plant citrus trees into their permanent positions. They should on no account be planted deeper than they stood in the nursery. Water each tree immediately after planting it to settle the soil, then loosen the surface when sufficiently dry to check weed growth and restrict evaporation; continue loosening the surface soil after each rain or watering. If good rains have fallen, disc the grove in two directions, then sow the cover crop and harrow also in two directions. If the grove is weedy it should receive a shallow ploughing in place of the discing. Then sow the seed and harrow the soil. All bearing trees must be kept well watered if the weather continues to remain dry. Trees that suffer for want of moisture while the young fruit crop is developing will be adversely affected, and the crop—if any—will be of inferior quality. Continue to rub off all water shoots or suckers which develop on the tree stems.

CROPS.

Keep the cultivators going, both on planted and unplanted lands, whenever weather conditions are favourable. Destroy the weeds while young and before they obtain a firm root-hold.

Continue planting maize, cotton, beans and ground-nuts as early as possible this month, followed by sunflowers, Sudan grass, manna, pumpkins and cattle melons. Linseed, cowpeas, teff grass, oats, Sunn hemp should be planted after the other crops are in. Ensilage crops may be

sown at the end of the month. When harrowing maize after planting, this work should be done in the heat of the day when the young plants are flaccid and not easily broken. On lands not yet planted the crop of weeds should be kept down by disc-harrowing. It is a good plan to harrow or disc-harrow immediately before the planter, or alternatively to follow the planter with a light harrow. Treat seed oats for smut before sowing. Use one pint of formalin to 25 gallons of water and steep the bag of seed for ten minutes. Earth up early planted potatoes. Keep a look out for the stalk-borer, and top or otherwise treat affected plants. New lands and old pastures may be broken, as circumstances permit, during December, January and early February, and again ploughed in from May to July. If they carry a heavy crop of grass it should be cut or burnt to enable good, clean ploughing to be done. Sweet potato slips should be planted early in this month. Do not fail to have in a few acres of this valuable crop.

DECIDUOUS FRUITS.

Cover crops may be planted when the rains commence, as recommended under citrus fruits. Summer pruning may be commenced this month. If all undesirable shoots are taken out of the trees, the remaining shoots will receive sufficient air and light to mature. Ripening fruit must be carefully harvested, graded and packed if satisfactory prices are to be secured. Do not gather any fruit when it is wet. Keep all recently planted trees in good condition; the first year's growth is the most important. If the undesired shoots are rubbed off when they first appear, the retained shoots will receive all the nourishment and the tree will then grow to a large size.

ENTOMOLOGICAL.

Maize.—The first half of this month appears to be the best period during which to plant maize for the avoidance of stalk borer attack—at least in the Salisbury district. Hoe out and remove volunteer maize plants before the new crop is up, as they are liable to be infested with borer, which tends to spread to surrounding plants. Red soils may be baited with chopped Napier fodder or other suitable greenstuff dipped in arsenite of soda 1 lb., cheapest sugar 8 lbs. or molasses 1 gallon, water 10 gallons, to destroy surface beetles, snout beetles and other insects which may affect the primary stand.

Tobacco.—The enemies of this crop are in general most active during December, whilst the crop is still in the early stages of growth.

For information regarding tobacco pests, see "Rhodesia Agricultural Journal," January, 1928, or Bulletin No. 665.

In general, poisoned baits may be used against surface beetles, grasshoppers, crickets and cutworms. Against surface beetles; arsenite of soda 1 lb. in 30 gallons of water used to moisten maize bran is a good bait. Against grasshoppers and crickets the addition of 8 lbs. sugar or 1 gallon molasses to each 1 lb. of arsenite of soda is recommended. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water against leaf-eating insects and as a protection against leaf miners and stem borer. Transplants may be dipped head downwards as far as the roots in the poison. Discard seedlings infested with stem borer and root gallworm.

Cutworms.—Keep ground around seed beds as free as possible from vegetation, to prevent female moths from laying eggs there. From the time the plants show foliage of the size of a sixpence they should be sprayed weekly with arsenate of lead (powder) 1 lb. to 30 gallons of water. This should prevent cutworms developing in the beds, as the young cutworms attack the leaves of the seedlings, and so ingest the poison.

House Flies.—With the coming of hot weather and the rains, house flies greatly increase, and should be kept out of dwelling houses by mosquito netting, or poisoned in the following way:—Dissolve 1 lb. of sodium arsenite in 10 gallons of water, and add about 10 lbs. of cheap sugar (2 gallons of treacle) or other sweet substance. The mixture should be sprayed

upon branches of shrubs or trees, which may be hung up in convenient places where flies congregate. These insects are attracted to the bait, and *are easily poisoned.*

Mosquitoes, Stable Flies.—Destroy breeding places around homestead. Poison or trap adults.

Potatoes.—Ladybirds and caterpillars may be injurious to the foliage, *and on sandy soils blue blister beetles sometimes cause damage.* Spray with arsenate of lead (powder) 1 lb. to 25 gallons of water.

Kitchen Garden.—Marrows, etc., are commonly attacked by leaf-eating beetles. Spray with arsenate of lead (powder) 1 lb. in 25 gallons water, plus 8 lbs. cheapest sugar or 1 gallon molasses. Dusting lightly with pure arsenate of lead powder should give protection. Young plants of the cabbage family may be dusted with pure arsenate of lead powder or with such powder mixed with up to six or eight parts of finely sifted, thoroughly slaked lime as a protection against leaf-eating insects.

Fruit Trees.—*The regular collection and destruction of fruit beetles may* be necessary. Choice varieties of peaches, etc., may be netted as a protection against pests.

FLOWER GARDEN.

This month is generally showery, and constant stirring of the soil is, therefore, necessary to keep it loose. Seeds of perennials and annuals for February blooms may be sown. Transplanting should be done in the evening or on a cloudy day. Carnations should be kept free from dead wood, and climbers attended to.

VEGETABLE GARDEN.

All vegetable seeds may be planted. All advanced plants should be constantly cultivated. Potatoes should be ridged, and peas, beans and tomatoes staked. This is a good month for planting the main crop of potatoes.

FORESTRY.

Final preparations for planting should be made, including harrowing or pitting. Early plantings may be carried out if the season is a good one. *Planting should be carried out on dull, rainy days, or failing such* days, late in the afternoons. Great care should be exercised in planting out to avoid bending the tap root, and to set the trees in the ground at the same level as they were in the seed bed or tray. Late sowings of Cedrela toona seed may be made.

POULTRY.

The poultry keeper should take precautions whereby the wet weather will not affect his birds' health and their laying powers. All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs. Foodstuffs also must be kept absolutely dry.

Many birds will at present be moulting; these require special treatment to bring them through it quickly, and if possible keep them in lay during the period. A pamphlet on this can be obtained from the Poultry Expert, Department of Agriculture. This lack of attention to the birds during the moult is one of the causes of the scarcity of eggs at this season. There is no need for it if poultry keepers would only look after their birds properly.

Those who intend disposing of their turkeys for killing at Christmas must avoid cooping them up, as is done when fattening fowls, for they immediately mope and go off their food. Give them free range, and in addition to their usual evening feed of maize, during the first week of December give one of wheat or maize in the morning, and during the second and third weeks three meals a day, each one containing, in addition

to wheat or maize, some crushed monkey nuts or sunflower seeds. Plenty of thick milk and chopped-up onions or onion tops should also be given.

Those who go in for ducks should feed well and get as many to marketable size as possible by Christmas, when they usually fetch good prices. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, maize meal, meat meal and milk, as much as they will eat three times a day, i.e., they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

STOCK.

Cattle.—Feeding should be continued on the same lines as in November. Keep a close eye on any store bullocks that have been selected for fattening on grass.

Ranching cattle should not require any attention beyond dipping. Every effort should be made to have all the female stock in good condition for the breeding season.

Milch cows should be protected as much as possible from cold rains and hot sun. Yarding at night in a clean kraal provided with a simple lean-to shed well bedded up will be found to be very beneficial in seasons of protracted rainfall. The calf-pen should be kept clean, dry and sweet, and young calves will be better kept in during very hot or very wet weather.

Sheep.—Graze on the higher lands, keeping the kraals clean, dry and airy, and watch for ticks. Take out the rams at the end of the month.

DAIRYING.

During the months of December and January veld grazing is usually plentiful, and very little extra feed in the form of concentrates is required for dairy stock. It should be borne in mind, however, that heavy milking cows are unable to satisfy their requirements for milk production from veld grazing alone, and should receive a daily allowance of grain; the latter should be fed at the rate of 2 lbs. for every gallon of milk produced daily, i.e., a cow producing three gallons of milk should receive 6 to 7 lbs. of concentrates. An excellent mixture for this purpose is one consisting of four parts maize meal and one part ground-nut cake.

During wet weather, the provision of a clean dry shelter for calves is essential; the latter should not be crowded together in a small, damp, badly ventilated pen or muddy kraal. When treated in this manner, a calf is very liable to contract various ailments such as scour, etc. Scour is entirely preventable, and is usually caused by over feeding, or feeding from dirty pails, feed boxes, etc. Calves which contract scour should be isolated, the milk ration reduced, and they should be dosed with a few tablespoonfuls of castor oil.

Under the weather conditions which now obtain, cream should be despatched to the creamery at least three times a week. It is of the greatest importance that cream should be cooled immediately after separation, and should be kept cool while on the farm and whilst in transit to the railway station or siding. While the cream is being cooled, it should be frequently stirred, using a stirrer with a plunger attachment. Warm, freshly separated cream should not be mixed with old cream which has already been cooled. Cool the fresh cream first and then mix thoroughly with the old cream. Gassiness is a common defect in the cream received at the creameries at this time of the year, and is caused by gas-producing organisms with which the milk and cream are contaminated. These organisms abound in mud, manure, etc., and develop and multiply very rapidly at high temperatures. Any precautions therefore which may be taken to eliminate dirt, manure, etc., from the milk and to keep the cream cool will prevent the development of gassiness.

As the night temperatures are fairly high, cheese-makers should not attempt to use night's milk for cheese-making; morning's milk plus a starter will give the best results. Gouda cheese-making operations are not usually successful at this season of the year, owing to the poor quality of the milk and the prevalence of gassiness. This type of cheese is best manufactured during March and subsequent months.

TOBACCO.

Continue preparation of land. The best results are obtained by transplanting on well prepared soil. Transplanting should be pushed on with as fast as transplants and climatic conditions will allow. As soon as plants begin to grow, go over the field and fill in all missing hills with strong selected plants, and then apply fertiliser to hasten growth and ensure early maturity. Cultivation should be commenced as soon as the plants start growing, especially on sandy soils. The crust caused by heavy rains should be pulverised through cultivation as soon as the surface soil is dry enough for tillage; this gives the young plants the benefit of the moisture stored in the soil. Do not neglect the late sown seed beds. Make every effort to finish transplanting before the end of the month, so that the crop will be harvested before dry, cool weather begins.

VETERINARY.

Occasional cases of horse-sickness may occur during this month. With the great increase in ticks, due to the heat and moisture, cases of redwater and gall-sickness may be expected, more especially amongst Colonial stock imported since the last rainy season. The cool weather which frequently follows the early rains is an excellent time for castrating calves and other animals.

WEATHER.

In Mashonaland the rainfall during this month varies from eight inches along the eastern border to six inches in the west. In Matabeleland it varies from five-and-a-half inches in the west to four-and-a-half inches in the south. Considerable divergencies from these normals may occur in individual seasons, but on the whole this month is the most regular in its behaviour. Very heavy downpours may be looked for, and it is well to be provided by drains and ditches against the effects of very heavy rain storms. A dry spell about Christmas time is a very frequent, though not invariable, event in Rhodesia. This partial drought may last only a fortnight, or may extend to six weeks, in the latter event often causing some anxiety regarding young crops, especially those not yet through the ground. The best means of meeting this condition of the weather is by frequent surface cultivation by harrow or horse hoe to preserve a loose soil mulch on the surface and prevent losses of soil moisture by evaporation.

January.

BEE-KEEPING.

This month is a slack one for actual hive work. Each hive should continue to be carefully watched to see that any attempt by the wax moth to gain a footing is at once stopped. In the great heat of this month, see that proper ventilation is supplied, as well as enough water. Precautions against the depredations of white and other ants should also be watched daily. Where possible, examine now and again the brood chamber for queen cells, and destroy them if not wanted. Requeening can be done where desired on the uniting system, if the apiarist does not know of the better plan of rearing his own queens. In the workshop have a spare hive

or two complete and ready for occupation, well painted, for any new swarms that may be required in the coming months. Though the second honey flow of the season is not due to start until about March or April, there should be ample stores coming in meanwhile to keep all bees busy in breeding, nursing, and bringing the hive generally to full strength for the winter, as well as for their own daily food supplies. There will not be enough honey coming in now for surplus purposes, therefore see that the supers are not left on the hives to a greater degree than to give the inmates plenty of room to loaf in.

CITRUS FRUITS.

The planting of citrus trees should be completed if possible by the end of the month. for trees planted later may not harden up before the winter; they then become susceptible to winter injury from cold. This month is the best one for planting shelter belts to protect all varieties of fruit trees from the prevailing dry winds. Cover or green crops may be planted during this month; if the grove has been over-run with grass or weeds, sow the cover crop seed more thickly. This will assist in smothering future weed growth. Continue suppressing any undesirable shoots that may develop on the tree trunk or other parts of the tree. Drain any depressions that allow rain or irrigation water to accumulate at the base of the trees, for trees permitted to stand in water will speedily fall victims to disease or pest injury.

DECIDUOUS FRUITS.

Continue planting cover or green crops between the trees. These crops may then be turned under towards the end of the rainy season to furnish the necessary humus.

Summer pruning may be continued. Rub or break off any undesirable shoots that have a tendency to crowd each other; suppress all growths on the main stem from the ground level up to the main arms of the tree, for these are unnecessary. If next year's fruit crop is to be of good size and quality, the inner fruiting wood of a tree must receive sufficient air and light to mature fully. If the new growth is too dense it will prevent the fruiting wood from maturing, and poor crops will be the result. The thinning out of the summer growth will overcome this crowding and weakening of the fruiting wood.

Many fruits will be ripening during the month. Do not permit the fruit to become over-ripe on the trees; rather harvest it at the correct stage and store or sell the surplus.

Plant shelter trees if the orchard is exposed to the prevailing winds, as good crops of fruit cannot be expected from inadequately protected fruit trees.

CROPS.

If not already sown, put in the ensilage and fodder crops at once, such as maize and legumes, oats and other hay grass crops. Sow short season crops like haricot beans, linseed, buckwheat, peas, summer oats, gram and mung bean. Plant out grasses and kudzu vine for pasture. Ridge potatoes and cultivate thoroughly. Main crop can still be planted. Quick growing green manuring crops, such as cowpeas, soya beans and sunn hemp, may still be sown this month. Earth up ground nuts so that a small amount of loose soil is thrown over the crowns of the plants. This assists the formation of nuts. If not already done and where practised, legumes or long season oats such as Algerian can be sown under the maize crop for grazing and to add nitrogen and humus to the soil. Cultivate all growing crops well, and thoroughly eradicate weeds. Overhaul all hay-making implements and ploughs and get in thorough repair in preparation for the haying and ploughing seasons. Endeavour to mow grass fields early for hay and litter, and to obtain second cutting for hay in April. Fallowed lands or fields not yet planted may be disc-harrowed or ploughed to prevent weeds from seeding. Mow grass paddocks

infested with annual weeds to prevent the weeds seeding. Prevent Mexican marigold and other noxious weeds seeding by hoeing or pulling out the plants by hand. Keep a sharp look-out for maize stalk borer. Cut off the tops of infested plants or treat them with a recognised chemical preparation. If topping is practised, remove tops from land, and bury, burn or feed them at once to farm stock. Watch the maize lands for witch weed. Prevent witch weed plants from seeding by cultivation and by hand-pulling the plants. Make as much manure as possible by placing grass and litter in cattle kraals, pig sties and stables. If there is stumping and clearing to be done, push on with it. Endeavour to get as much of the new virgin land as possible broken up during this and the two following months.

ENTOMOLOGICAL.

Maize.—Late planted maize, particularly crops planted after the New Year, are frequently attacked by the maize stalk borer (*B. fusca*, Full.) in districts where this pest is prevalent. The yield of grain from heavily attacked stands is usually very low, and such crops are most economically used as ensilage. Plants attacked are easily detected in the fields, as the newly hatched caterpillars eat the young leaves before entering the stalk. Top dressing with a suitable insecticide should be employed to ensure a good yield. There are several insecticides which can be used for top dressing which kill the young caterpillars without causing severe injury to the plant. Kerol, Kymac or Hycol used at a dilution of 1 in 300, or Pulvex, 1 in 54 gallons of water, give satisfactory results. A new preparation, Derrisol, is highly recommended by the manufacturers at 1 in 1,000, and is stated to be quite innocuous to the plants. The liquid should be poured into the funnel-shaped cup formed by the young leaves. Only those plants showing attack are usually treated. With a light infestation, one native can treat about five acres per day. Several treatments may be necessary. Young maize plants up to six weeks old can be treated by cutting the plant below the point attacked. The portions cut off must be removed from the lands.

Various leaf-eating insects (including the snout beetle (*Tanymicus destructor*), the surface beetles, grasshoppers, etc.) attack young late-planted maize.

The attack by the snout beetle may be very severe. If there is time, it is often advisable to harrow in the old crop, treat the land with poison bait and re-plant, or poison bait may be used without removing the crop. The best carrier for poison bait is chopped Napier fodder or some other green succulent grass, including maize itself; failing this, maize or wheat bran may be used. The carrier is thoroughly covered or impregnated with a solution of arsenite of soda 1 lb., molasses 1½ gallons, or cheapest sugar 8 lbs., water 10 gallons, and broadcast. The cheapest arsenite of soda to employ is locust poison, diluted 1 in 200, and equivalent quantity of sweetening agent added. The best results are obtained if the broadcasting is done in the evening, as the hot sun dries up the bait too quickly and renders it unattractive to the beetles.

Army Worm (*Laphygma exempta*) may put in an appearance during the latter half of December, and a sharp look-out should be kept for the caterpillars, especially on sweet grasses near the maize lands and on "rapoko grass" (*Eleusine indica*) on the lands. (See *Rhodesia Agricultural Journal*, October, 1930, page 1055.)

Black Maize Beetle.—Both larvæ and adults of this beetle are active during this month. Hand collecting of the adults is the only practical procedure. For further control measures, see *Rhodesia Agricultural Journal*, February and April, 1925.

Potatoes.—This crop, if attacked by leaf-eating ladybirds, blister beetles or other leaf-eating insects, may be sprayed with arsenate of lead (powder), at the rate of 1 lb. in 25 gallons of water. This poison may be combined with Bordeaux Mixture when spraying against early blight.

To protect potatoes from potato tuber moth, the rows should be ridged deeply and the tubers kept covered with soil.

Tobacco.—Tobacco in the field is attacked by many insects during this month, and growers should keep a copy of Bulletin No. 665, "Tobacco Pests of Rhodesia," handy for reference, or refer to *Rhodesia Agricultural Journal* for January, 1928. The following very brief account of the more common insect pests attacking this crop may help the grower who cannot consult the above-mentioned bulletin.

Cutworms.—Keep all lands free from weeds up to the time of planting out.

Stem Borer.—All seedlings showing the characteristic swelling should be destroyed by fire. Plants in the field should be destroyed and replaced, or the plant may be cut off below the swelling and one sucker encouraged to grow. The latter procedure needs to be carried out early.

Leaf Miner.—All primings should be destroyed, and infected leaves may be picked off.

Seed Beds.—Seed beds which are no longer required should be cleaned up and not allowed to become a breeding ground to infest the fields. Beds in use should be kept properly covered with limbo and sprayed weekly with arsenate of lead, 1 lb. in 30 gallons of water.

Wire Worms (*Trachynotus* spp.).—Several species of wire worms attack this crop during January, particularly on sandy soils. It is now too late to attempt control. Control depends upon the accurate timing of the emergence of the adult beetle and poisoning with a poison bait. Emergence usually takes place late in April or in early May. The bait consists of maize meal or bran poisoned with arsenite of soda (locust poison, 1-200). The bait is made up into balls, scattered about the lands. The balls should be covered with leaves, to give attractive shade and to assist in keeping the bait moist. Moisture should be added when necessary.

Surface Beetles (*Zophoses* spp., *Gonocephalum* sp.).—The same control measures apply as for wire worm. Baits recommended against wire worm can be applied during January. No sweetening matter is necessary.

Bud Worm (*Heliothis obsoleta*).—Destroy all caterpillars by hand during "topping." Examine all bagged seed heads weekly and destroy any caterpillars discovered.

Other Leaf-Eating Caterpillars.—A bad attack in the field may be controlled by spraying with arsenate of lead (powder), 1 lb. to 30 gallons of water. A knapsack spray pump with a cyclone nozzle is necessary. Hand picking may be employed.

Beans, Cowpeas, etc.—Haricot beans and cowpeas are liable to attack by the stem maggot (*Agromyza* sp.). This small fly deposits its eggs in the young leaves, often within a few days of germination. The larvæ mine along the veins and down the stem, pupating about soil level. Practically nothing can be done to protect a field crop. Velvet beans, Jack beans and dolichos beans are not attacked by this pest.

All varieties of beans are attacked by a leaf-eating beetle (*Ootheca mutablis*). This small insect can be controlled by spraying with arsenate of lead (powder), 1 oz. to 3 gallons of water.

Blister beetles are often very numerous on the flowers of all species of beans and cowpeas. Hand collecting has been found to be the most economical measure.

The bean stem weevil is a minor pest of beans in the kitchen garden. All plants attacked by this weevil should be picked out and burnt.

Sweet Potatoes.—Sweet potatoes may be attacked by caterpillars of the sweet potato sphinx moth. These should be collected by hand.

Kitchen Garden.—Marrow and cucumber plants about to set fruit may be sprinkled regularly with the following formula to destroy fruit flies

which "sting" fruit:—Arsenate of lead (powder), 1½ ozs.; molasses, ½ gallon, or cheapest sugar, 2½ lbs.; water, 4 gallons. To destroy leaf-eating insects generally, dust plants with arsenate of lead (powder), 1 part in 20 parts of finely-ground maize meal or finely-sifted slaked lime. *Aphides* (plant lice) may be treated with soap, 1 lb. in 5 gallons of water, or tobacco wash, or simply by regular spraying with a forceful stream of cold water from a spray pump.

Fruit Trees.—Deciduous fruits are subject to attack by large beetles, which should be destroyed by jarring into a net and dropping thence into a tin containing water, with a film of paraffin on the surface. Trees should be covered in mosquito netting to protect the fruit from fruit-piercing moths. The large adult beetles of the fig borer may be seen on the young shoots and should be destroyed. Borers in the trunks of the trees may be killed by injecting a little carbon bisulphide.

Mosquito, House Flies, etc.—Screen windows and doors. Destroy breeding places around homestead. House flies may be poisoned cheaply with sweetened arsenite of soda solution. Write for directions.

When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.

FLOWER GARDEN.

This month requires all one's energy in the flower garden. Annuals may still be sown for late flowering before the season is over. Planting out should be done as early as the weather permits, and advantage taken of a dull day after a shower for this work. If care be exercised much smaller plants may be put out than would at first be thought advisable, as with attention these will make stronger plants than larger ones, which are more likely to receive a check. The soil requires constant stirring, owing to the packing caused by the rains and for the eradication of weeds, which are now very troublesome. All plants should be kept free of dead and decaying matter.

VEGETABLE GARDEN.

Turnips, carrots, cabbages, lettuce, etc., may be sown for carrying on during the winter months. Potatoes may be planted this month for keeping through the winter. Weeding and cultivating between the rows should be continually carried on.

FORESTRY.

If the rains are seasonable, plant out evergreen trees, such as gums, cypress, pines, etc. Fill in all blanks as soon as they are noticed, and do not leave them until the following season. Planting should be done on a wet day, or, failing that, on a dull day, or late in the afternoon. Great care should be taken to see that the trees are not planted out any deeper than they stood in the tins.

POULTRY.

All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs.

Foodstuffs must be kept absolutely dry, otherwise they will become mouldy and sour, causing disturbance of the intestinal tract, illness, and perhaps death; certainly a diminution in the number of eggs.

Some of the birds will now be in moult. To get them through it quickly give more sunflower seed, some monkey nuts, plenty of green food, especially cabbage, kale, etc., plenty of milk or some meat, a little sulphur

in the dry mash (one teaspoonful to 1 lb.); also stew two dessert spoonfuls of linseed in a pint of water to a jelly, mix this to a crumbly consistency with mealie meal or bran, and give about one dessert spoonful to each bird daily. Keep the birds dry during the rains, otherwise the egg output will decrease.

Do not hatch any more turkeys till after the rainy season is over. Turkeys should not be penned up, but allowed on free range.

Ducks must be treated in almost exactly the reverse manner to what turkeys are. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, mealie meal, meat meal and milk, as much as they will eat three times a day, *i.e.*, they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

STOCK.

Cattle.—Put the bulls into the herd now to secure spring calves. The bulls should be in good condition at the commencement of the service season and their condition should be maintained while they are working. This season calves should be looking well by this time and care must be taken not to over-milk the cows in consequence. Cows rearing calves should not be milked more than once a day. Hand-reared calves should be kept in dry, clean quarters. In the warmer weather they often do better if they are kept indoors until they are three or four months of age. Bullocks which are being fattened on grass should receive a concentrate ration from now onwards. During this month a protein concentrate should usually be added to the milch cows' ration.

Sheep.—Keep the sleeping quarters as dry as possible. Keep the sheep away from vleis and "rotate" the grazing as much as possible. Sheep are liable to suffer severely from internal parasites from now onwards.

DAIRYING.

(See December.)

TOBACCO.

Cultivation should be systematically continued, and no foreign vegetation allowed in the tobacco field, as weeds and grass induce insect attacks. All backward plants should be given special attention, and an additional application of fertiliser to hasten growth, so that the plants ripen as uniformly as possible. Curing barns should be placed in proper condition on rainy days, and all tobacco appliances should be placed in proper order for the rush of work during the curing season. Early planted tobacco may be ready for topping during the latter part of the month, and the common mistake of topping too high should be avoided. Go over the field carefully and select typical, uniform and disease-free plants for producing seed for next season's crop. All plants should be properly primed at the same time that the tobacco is topped.

VETERINARY.

Horse sickness may now be expected, especially in districts where early heavy rains have occurred. Blue tongue in sheep will also be prevalent.

WEATHER.

Heavy rain is to be looked for, and during this month we may normally expect nine to twelve inches on the eastern border, eight in the north, and seven to seven and a half as one travels westwards or southwards. At this time of the year the rainfall tends to be heavier in the eastern than in the western portions of the Colony, whilst prolonged steady rains take the place of the thunder showers which marked the earlier part of the wet season. The growing period is at its height, and high temperatures are registered.

SOUTHERN RHODESIA VETERINARY REPORT.

September, 1932.

AFRICAN COAST FEVER.

Rocklands Estate.—Fifteen head of stray cattle were rounded up and isolated near Rocklands homestead. One case of coast fever occurred and the remainder were slaughtered.

Glencoe.—Two cases of coast fever occurred on this farm. The herd involved was moved to a temperature camp on the adjoining farm, Hayfield.

FOOT AND MOUTH DISEASE.

Insiza District.

No fresh outbreaks. In the Siwazi and Mbondu dipping tank areas all the cattle concentrated for inoculation had been returned to their respective kraals by the 17th September.

Gwanda District.

A fresh outbreak occurred on the farm Timber adjoining the previously infected farm Deneys. Infection was carried by four bulls, which strayed from Deneys. A cattle-free belt was established around Timber and Deneys by removing all cattle from adjoining farms except on the eastern side, where the cattle are immune. Most of the cattle so removed were concentrated on Timber and Deneys and inoculated. It is hoped that these arrangements will confine the disease to Deneys and Timber.

On Railway Block No. 2 all the inoculated herds had recovered completely.

GWELO DISTRICT.

No fresh outbreaks. The herds inoculated during August in the Sonambula section reacted satisfactorily, except in one herd of 75 head in which active infection was found four weeks later. It is difficult to account for the delayed reactions in this case as the same virus used on the other herds on the same day gave satisfactory reactions.

In the eastern section of the district a fresh outbreak occurred on Gold Fields South (Rhodesdale), east of the Bembezaan River. All the herds involved and in contact were concentrated and inoculated.

ANTHRAX.

An outbreak occurred amongst cattle in the Bromley section of the Salisbury district. All in contact animals were vaccinated.

IMPORTATIONS.

From the Union of South Africa and the Bechuanaland Protectorate: Cows and calves 10, heifers 4, bulls 7, horses 9, mules 1, sheep 1,458, goats 115.

EXPORTATIONS.

June: 41 carcases beef to Great Britain.

August: 40 carcases beef to Great Britain.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

SOUTHERN RHODESIA WEATHER BUREAU.

OCTOBER, 1932.

Pressure: The mean barometric pressure varied from 1 to 2 millibars above normal.

Lows were active on the south coast from the 1st to the 4th. A high appeared on the west coast on the 4th and moved up the east coast on the 5th, causing strong S.E. winds and some drizzle. Pressure changes were slight until the 14th, when a deep low approached the south coast; it remained and deepened during the 15th and 16th and then disappeared. The succeeding high was late and only approached on the 18th. A low on the south coast on the 18th and 19th left the equatorial low, extending into the Union on the 20th. The succeeding high on the 22nd had little effect. A deep low on the south coast on the 24th and 25th was followed by a weak high, which moved up the east coast on the 26th. A second high appeared on the south coast on the 28th and deepened and approached on the 29th. Strong south-east winds and some rain were experienced on the 29th and 30th.

Temperature.—Mean minimum temperatures were generally about normal but maximum temperatures, particularly in the Midlands, were well below normal.

Rainfall.—Very light rains occurred in a few areas and the average over the country only amounted to 0.2 inches.

Rain Records.—A summary of the daily rainfall telegraphed from 57 stations is shown grouped in the forecast areas, indicated in the accompanying map.

OCTOBER, 1932.

Station.	Pressure Millibars, 8.30 a.m.		Temperature in Stevenson Screen °F.								Rel. Hum.	Dew Point	Cloud Amt.	Precipitation.			Altitude (Feet).
			*Absolute.		Mean.												
	Mean.	Normal.	Max.	Min.	Max.	Min.	½ Max. Min.	Normal.	Dry Bulb.	Wet Bulb.	%	F.	0-10	Ins.	Normal.	No. of Days.	
Bulawayo ...	...	869.1	...	...	...	...	...	72.3	..	...	...	...	...	...	0.9	...	4,436
Gwelo ...	864.5	...	93	47	84.8	57.1	71.0	72.5	70.0	58.6	50	50	2.7	...	0.7	...	4,632
Riverbank ...	...	...	100	49	90.6	61.2	75.9	76.0	73.1	59.3	43	49	...	0.24	0.7	2	4,100
Essexvale ...	...	...	101	45	91.3	58.6	75.0	74.2	71.2	60.5	53	53	..	0.18	0.8	2	3,828
Gwanda ...	908.2	...	99	45	86.2	61.4	73.8	...	73.3	60.0	45	51	2.5	0.61	0.9	2	3,235
Mazunga ...	950.4	949.3	104	45	90.4	60.8	75.6	77.3	75.0	63.3	52	57	4.5	0.67	1.0	2	1,970
Nuanetsi ...	...	...	103	48	90.5	61.0	75.8	...	72.3	64.6	66	61	3.9	0.73	0.9	3	1,630
Between Rivers	...	...	97	46	89.6	59.1	74.4	...	75.2	59.9	40	49	1.1	0.39	1.4	3	3,970
Enkeldoorn ...	859.4	...	91	48	83.4	56.0	69.7	71.3	71.2	58.2	45	48	1.1	...	1.3	...	4,720
Gatooma ...	...	...	97	49	90.6	58.8	74.7	76.2	73.3	60.1	45	51	1.0	0.01	1.1	1	3,850
Miami ...	879.8	...	93	52	86.2	60.6	73.4	...	74.7	60.2	42	50	0.8	0.58	0.2	3	4,090
Salisbury ...	856.6	855.7	91	50	83.8	57.9	70.9	71.0	71.0	57.1	41	47	1.8	0.03	1.3	1	4,890
Sinoia ...	889.2	...	98	51	90.0	58.8	74.4	...	77.0	60.9	38	50	0.6	0.32	1.2	3	3,804
Sipolilo... ...	...	...	93	55	85.5	64.5	75.0	...	74.0	59.7	42	49	0.9	0.07	0.7	1	3,900
Mtoko	...	...	...	...	...	...	...	...	...	..	...	...	...	...	0.8	...	4,210
Shamva ...	...	...	98	53	90.4	62.9	76.7	...	77.4	...	...	...	0.5	0.02	0.5	1	3,170
Angus Ranch ...	...	...	100	55	89.6	64.1	76.9	...	75.8	64.3	53	58	...	0.57	0.9	1	2,300
Craigendoran ...	...	...	102	50	91.4	59.5	75.5	...	76.6	63.4	48	55	...	0.13	1.7	1	3,410
New Year's Gift	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1.2	...	2,700
Nyamasanga ...	...	...	90	47	82.3	55.0	68.7	...	71.9	58.2	42	47	...	...	...	...	5,080
Riverdene North	...	...	100	41	87.8	53.8	70.8	...	69.8	61.2	61	56	...	0.26	1.1	3	3,700
Stapleford ...	...	...	79	35	71.2	49.3	60.3	...	64.0	57.2	66	53	2.9	1.82	1.4	7	5,450
Umtali	895.2	894.4	90	49	82.5	58.2	70.4	70.9	70.2	60.3	56	54	3.1	0.58	1.2	3	3,677
Victoria ...	897.9	895.8	97	45	86.1	57.7	71.9	71.1	71.0	60.0	52	52	2.5	0.12	1.1	2	3,570
Melsetter ...	852.6	...	89	44	77.8	53.8	65.8	...	68.3	55.3	42	45	2.2	0.71	1.4	4	5,060
Mount Selinda	...	...	91	47	81.5	57.7	69.6	...	67.8	60.0	63	55	2.8	1.96	2.0	3	3,520
Manchester ...	...	...	81	41	73.2	52.8	63.0	...	56.3	53.4	83	52	...	1.41	...	3	...

Rainfall, October, 1932, in Hundredths of an Inch. Telegraphic Reports.

Area	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total.
1	17	15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	...	...	355
2	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	...	...	1	32	...	...	41
3	...	...	...	...	15	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	9	...	...	...	...	...	...	1	77	...	...	103
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1	5	...	...	7
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	14	...	1	25
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	45	16	4	65
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	3	15	27
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mean	4	3	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1	10	1	2	23

DEPARTMENTAL BULLETINS.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution at 3d. per copy. Application should be made to the Editor, Department of Agriculture, Salisbury, and remittances must accompany orders.

AGRICULTURE AND CROPS.

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No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.

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No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.

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No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.

No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance" during the year 1927-28.

No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.

No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.

No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).

No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.

No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.

No. 727. *Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural* Chemist.

No. 732. Two Common Diseases of Potato Tubers in Rhodesia, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.

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No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.

No. 759. Witch Weed (Striga Lutea) : Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" *as Fertilisers for Maize Production, by A. D. Husband, Chief* Chemist.

No. 768. The Ground Nut (Arachis hypogaea), by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 775. Agricultural Costings at the Gwebi Farm, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.

No. 776. Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.

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No. 797. Green Manuring: An Essential Practice in Rhodesian Farming, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

No. 802. Witch Weed, by S. D. Timson, M.C., Inter.B.Sc. (Agric.) Lond., Dip.Agric. (Wye), Assistant Agriculturist.

No. 807. Studies on the Improvement of Natural Veld Pastures: No. 2, by A. D. Husband, F.I.C., and A. P. Taylor, M.A., B.Sc., Chemistry Branch, Department of Agriculture.

No. 813. A Preliminary Note on Clovers in Southern Rhodesia, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.

No. 815. New Strains of Oats for Southern Rhodesia, by H. C. Arnold, Manager, Agricultural Experiment Station, Salisbury.

No. 816. Preliminary List of the more Common Grasses of Southern Rhodesia, by Sydney M. Stent, Botanist for Pasture Research.

No. 820. The Great Economic Problem in Agriculture—No. 1, by J. R. McLoughlin, M.Sc. (Economics), Economic Adviser.

No. 822. Re-stacking of Maize rejected for Export on account of Excessive Moisture.

No. 823. *The Law of Supply and Demand—No. 2, by J. R. McLoughlin,* M.Sc. (Economics), Economic Adviser.

No. 826. Some Poisonous Plants of Southern Rhodesia, by Sydney M. Stent, Senior Botanist.

No. 831. Revised Notes on Cotton Growing in Southern Rhodesia, by G. S. Cameron.

No. 833. Subterreanean Clover on the Sand Veld as Feed for Poultry in the Winter, by S. D. Timson, M.C., Dip.Agric.(Wye).

No. 836. The Potato, by S. D. Timson, M.C., Dip.Agric.(Wye).

No. 837. Veld Grass Silage—A Feature in Rhodesian Pasture Management, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief, Division of Plant Industry.

No. 838. Witch Weed—Progress Report and a Warning, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.
No. 841. Poisonous or Suspected Poisonous Plants of Southern Rhodesia: Tulp Poisoning of Cattle, by Sydney M. Stent, Senior Botanist, and D. A. Lawrence, B.V.Sc., Veterinary Research Officer.
No. 855. Pigeon-hole Method of Stacking Maize, by Division of Plant Industry.
No. 859. Twenty-one Years of Plant Introduction, by Major Mundy, Chief, Division of Plant Industry.
No. 867. Agricultural Statistics for the Season 1930-31: (a) Live Stock; (b) Crops Grown by Europeans in Southern Rhodesia, compiled by the Government Statistician.

REPORTS ON CROP EXPERIMENTS.

No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
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